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BLOOD ANOMALIES IN RADIOLOGISTS AND IN PERSONS EMPLOYED IN RADIOLOGICAL SERVICE

by

P. Amundsen, Christiania

Since the spring 1921 I have made, at the suggestion of Dr. HEYERDAHL, a series of blood examinations on doctors, medical students, nurses and other persons who »by virtue of their office» have been occupied with or exposed to Roentgen-radium-rays for a long or short period, either in the Roentgen-radium department of the Rikshospital or in our private Roentgen-Institute. The reason for this was the alarming news which came from England of deaths from aplastic anaemia occurring among radiologists and their personel. (MOTTRAM,[1] LARKINS[2].) In a number of the Acta Radiologica (Vol. II, Fasc. 2, No. 6) FABER reports on a case of aplastic anaemia (Dr. NORDENTOFT, the radiologist).

Technique. The specimens of blood are taken as far as possible at about 11 or 12 in the morning. The percentage of hemoglobin is estimated by the metod of SAHLI, so that 80 degrees of SAHLI = 100 per cent. The count of the red and white blood cells is done in a THOMA-ZEISS blood counting apparatus. PAPPENHEIM's modified MAY GRÜNWALD method has been employed in staining the smears for differential counting. The large mononuclear cells and the so-called transitional forms of ERLICH have been referred to the monocyte group.

[1]) I. C. MOTTRAM: The red cell blood content of those handling radium for therapeutic purposes, Arch. of Radiology and Electrotherapy, Dec. 1920.

[2]) F. E. LARKINS: A case of acute aplastic anaemia, Arch. of Radiology and Electrotherapy, May 1921.

Tabula I shows the result of the first examination I made of persons employed in radiological work:

Tab. I.

No.	Sex, Occupation, Age	Leng of occupation in Roentgen-radium work	Hemoglobin	Colour index	Red blood cells	White blood cells	Polynuclear leukocytes	Lymphocytes	Monocytes	Eosinophils	Mast cells
			%		Mill.		%	%	%	%	%
1	Male, Physician . . . . . 51 years	23 years	108	0.95	5.76	6800	57.9	37.6	3.4	0.8	0.3
2	» » . . . . . 40 »	6½ »	112	0.98	5.76	6000	58.6	34.8	4.8	1.7	0
3	Female, Head-nurse . . . . . 41 »	5 »	112	1.02	5.52	5800	43.0	45.0	6.1	5.1	0.8
4	Male, Physician . . . . . 29 »	2 »	112	1.27	4.48	7400	43.0	51.0	6.0	0	0
5	» » . . . . . 31 »	3 months	120	1.13	5.36	5200	55.5	41.1	1.5	1.5	0
6	Female, Nurse . . . . . 31 »	6 »	112	1.12	5.04	5800	75.5	21.5	1.5	1.1	0.4
7	» » . . . . . 30 »	3 »	100	1.19	4.24	9400	69.6	26.5	1.8	1.4	0.7
8	» » . . . . . 36 »	5 »	100	0.94	5.36	5400	67.0	29.3	0	3.0	0.6
9	» » . . . . . 35 »	2½ years	112	0.90	5.07	4800	55.5	41.1	1.5	1.5	0.4
10	» Night-nurse in Rad. Dep. 45 »	6 months	100	1.22	4.16	5000	38.9	55.5	3.2	2.1	0.3
11	» Maid-servant » » » 24 »	2½ years	106	1.26	4.27	6000	62.8	32.4	1.9	2.2	0.7
12	» » » » » 26 »	2½ »	112	1.07	5.20	5200	53.4	41.3	3.9	1.1	0.3
13	» Assist. Photographer . . 26 »	1 year	108	0.91	5.84	8000	47.3	47.3	4.4	0.3	0.7
14	Male, Med. student . . . . . 23 »	1 month	106	1.13	4.71	6200	54.2	43.3	0.7	1.3	0.5
15	» » » . . . . . 22 »	1 »	119	1.32	4.48	8200	57.0	40.0	1.9	0.7	0.4

As will be seen from the above, the amount of hemoglobin of every one examined is 100 per cent or more. The colour index — which, as we know, denotes the hemoglobin value of each single red blood cell and is said to be normal, or 1, if 5 millions of red blood cells have 100 per cent hemoglobin — fluctuates about the normal. Any striking anaemia — erythrocytopenia — is not to be seen either. The number of white blood cells in one or two cases is slightly lower than the normal average, but never below the lowest limit. Most conspicuous is the proportion between the polynuclear leukocytes and the lymphocytes, — the percentage of leukocytes being decreased and that of the lymphocytes increased. Thus, a relative lymphocytosis.

Observe, that the two maid-servants (Nos. 11 and 12 in the tabula) and the night-nurse in the radium department (No. 10), who of course have nothing to do directly with radium, are keeping pace with the majority. But it is rather curious that lymphocytosis is present also in the case of the assistant photographer (No. 13). She is practically not exposed to Roentgen-rays, and her visits to the

radium department are limited to the time when she is taking ordinary photographs of patients with ulcers and tumours, and of course radium is not just then being applied to these patients. Wether her work in the dark-room has any effect on her, I am not able to say. In the large work of NÄGELI on diseases of the blood and blood diagnosis there is nothing to support such a supposition. Her blood picture is probably, in spite of all, due to the radioactive rays — secondary rays. The three nurses (Nos. 6, 7, and 8), whose blood pictures are normal, so to speak, fall a little outside of the frame. But, if one looks at Tabula II, one will find two of them again, with distinct changes in their respective blood pictures (Nos. 1 and 2).

It is also a very remarkable fact that the two medical students, after having been working for only one month as voluntary assistants, exhibited the usual »radiological blood picture».

Tab. II.

No.	Sex, Occupation, Age	Length of occupation in Roentgen-radium work	Blood picture	Polynuclear leukocytes	Lymphocytes	Monocytes	Eosinophils	Mast cells
				%	%	%	%	%
1	Female, nurse . . . . . 31 years	12 months	After 6 months	75.0	21.5	2.0	1.1	0.4
			» 12 »	68.7	28.3	0.3	2.0	0.7
2	Female, nurse . . . . . 30 »	8 »	After 5 »	69.6	26.5	1.8	1.4	0.7
			» 8 »	52.0	43 0	3.0	1.0	1.0
3	Female, nurse . . . . . 30 »	2 »	Before	72.0	25.5	2.9	0.5	0
			After	58.3	38.0	2.7	1.0	0
4	Male, Med. student . . . . . 23 »	2 »	Before	63.7	27.3	7.0	2.0	0
			After	57.7	32.3	9.0	0.7	0.3
5	Male, Med. student . . . . . 22 »	2 »	Before	66.3	29.0	4.0	0.3	0.3
			After	55.7	37.0	6.7	0 3	0.3
6	Female, Servant in Rad. Dep. . . . 22 »	3 »	Before	65.6	27.2	6.0	0.8	0.4
			After	61.7	37.0	0	1.3	0
7	Female, Servant in Rad. Dep. . . . 24 »	2 »	Before	68.0	28.7	3.0	0	0.3
			After	51.3	42.0	0.7	0	0

Tab. II shows the following: The two first numbers relate to the two nurses in Tab. I (Nos. 6 and 7). It is seen that the radiological work has had an effect on them also. The blood of the other ones has been examined immediately before they started their

Roentgen-radium work and after they had been working from 2 to $3^1/_2$ months. The blood changes will be apparant from the tabula and will be seen to exhibit the usual picture (cf. Tab. I). Since I have not found any obvious change either in the percentage of hemoglobin or in the absolute number of red and white blood cells, these numbers have not been included in the last tabula.

Tab. III shows how the blood picture in some persons becomes distinctly improved, even becomes quite normal, whereas in other persons no particular change can be seen after a vacation or some other absence.

Should anyone now eventually ask for an explanation of these blood pictures which we certainly may call abnormal, it is in my opinion this:

The first effect produced by the Roentgen-radium rays is a leukocytosis of short duration. This is followed by a leukopenia which mostly affects the lymphocytes. These are, however, regenerated very rapidly, and there are more of them produced than are destroyed. This over-production, as I may call it, of lymphocytes is very likely also to be interpreted as an attempt on the part of the organism to compensate for the leukopenia, if the lymphocytosis is not to be interpreted as post-toxic, cf. the Roentgen-toxin.

In radiological workers who get their large or small doses of radiation every day, degeneration and regeneration are probably going nicely hand in hand. At any rate I have found a remarkably great number of so-called young lymphocytes and some GUMPRECHT nuclei in most cases where lymphocytosis has been present. The large young lymphocytes would then be the new regenerated cells and the GUMPRECHT nuclei would be a sign of degeneration. (Perhaps the appearance of these nuclei may have been artificially produced, as the young lymphocytes are very easily injured in the preparation of the smear.)

Seen in the light of these mediations the cases of lymphatic leukocythemia that are reported as having occurred among radiologists may no doubt be interpreted as a lymphocytic regeneration overshooting the mark.

To cut it short: These and other investigations show that we are every day exposing ourselves to radiation which is not good for us in the long run. In spite of the universally employed means of protection: lead, rubber, and glass, some of the injurious rays reach us all the same.

A discussion of how the means and arrangements of protection are to be accomplished and of what they are to consist of, I consider to be beyond the scope of this article. But my opinion is

this, that everybody who is employed in Roentgen and radium work, should now and again look over and thoroughly test his protective arrangements. The new COOLIDGE tubes are dangerous. The penetrative power of the gamma-rays is fabulous.

During 1921 all the protective arrangements in the Roentgen-radium department of the Rikshospital were looked over and greatly improved. At the blood examinations that I made in February 1923 of the permanent personel, it was found that their blood pictures were not much different from the normal.

Tab. III.

No.	Sex, work done	Blood picture	Polynuclear leukocytes	Lymphocytes	Monocytes	Eosinophiles	Mast cells
			%	%	%	%	%
1	Female, Radium work . . . . . for 5 years	Before the leave	41.0	48.0	4.0	6.0	1.0
		After 2 months leave	55.3	42.7	1.3	0.3	0.3
2	Male, Roentgen-radium work . for 2 years	At the end of radium work . . .	43.0	51.0	6.0	0	0
		After 4 months absence	52.3	39.0	7.3	1.3	0
		After 16 months absence	52.6	39.3	6.4	1.0	0.7
3	Female, Servant in the Rad. Dep. for 2 years	At the end of radium work . . .	53.4	41.3	3.9	1.1	0.3
		After 17 months absence	70.0	27.0	2.0	1.0	0
4	Male, Roentgen work . . . . . for 2 months	At the end of roentgen work . . .	57.0	40.0	1.9	0.7	0.4
		After 14 months absence	75.0	22.0	0.5	2.5	0
5	Male, Roentgen work . . . . . for 2 months	At the end of roentgen work . . .	55.7	37.0	6.7	0.3	0.3
		After 12 months absence	63.0	35.0	1.4	0.6	0
6	Male, Roentgen work . . . . . for 2 months	At the end of roentgen work . . .	57.7	32.3	9.0	0.7	0.3
		After 14 months absence	58.3	33.8	7.2	0.7	0
7	Male, Roentgen work . . . . . for 10 months	After 1 month of roentgen work . .	54.2	43.3	0.7	1.3	0.5
		10 months after end of roentgen work	52.0	41.0	6.0	0.3	0.7

SUMMARY

The blood picture of radiologists and their personel always shows a deviation from the normal.

The absolute number of white blood cells is often less than the normal average. The change is most marked in the ratio of the polynuclear leukocytes and the lymphocytes: a reduced percentage of leukocytes and an increased presentage of lymphocytes (relative lymphocytosis). The percentage of hemoglobin has nearly always been found normal. The effect on

the blood is observed already following one or two months of radiological work and it can also be traced in the maid-servants of the radium department. The blood picture is distinctly improved after a long leave of absence. Improved means of protection are recommended so as to lessen the risk always incurred by all radiological workers. Blood examinations of the personel belonging to the Roentgen and radium institute of the Rikshospital, carried out a long time after the protective arrangements had been revised and improved, showed a considerable improvement of the blood picture of the permanent personel.

ZUSAMMENFASSUNG

Das Blutbild von Radiologen und von ihren Hilfspersonen zeigt immer Abweichungen vom normalen.

Die absolute Zahl der weissen Blutzellen ist oft kleiner als die normale Durchschnittsziffer. Am markiertesten ist die Veränderung betreffs des Mengenanteils der polynukleären Leukozyten und der Lymphozyten: reduzierter Perzentgehalt an Leukozyten und erhöhter von Lymphozyten (relative Lymphozytose). Der Perzentgehalt des Hämoglobins wurde fast immer normal befunden. Die Wirkung auf das Blut ist bereits nach 1 oder 2 Monaten radiologischer Tätigkeit beobachtet worden und kann auch beim weiblichen Dienerpersonal der Radiumabteilung nachgewiesen werden. Nach einem langen Urlaub ist das Blutbild deutlich verbessert. Verf. empfiehlt stetige Revision der Schutzmittel um das Risiko zu verringern, dem alle radiologisch Arbeitenden stets ausgesetzt sind. Blutuntersuchungen beim Personal des Röntgen- und Radium-Instituts des Reichsspitals, lange Zeit nachdem die Schutzmassregeln revidiert und verbessert worden waren, zeigten eine beträchtliche Verbesserung des Blutbildes bei den ständig dort beschäftigten Personen.

RÉSUMÉ

Le sang des radiologues et de leur personnel montre toujours des caractères différents du sang normal.

Le nombre absolu de globules blancs est souvent inférieur à la moyenne normale. La différence la plus prononcée se fait remarquer dans la proportion des leucocytes polynucléaires et des lymphocytes: le pourcentage des leucocytes est diminué, celui des lymphocytes est augmenté (lymphocytose relative). Le taux de l'hémoglobine est presque toujours normal. L'effet sur le sangs s'observe déjà après un à deux mois de travail radiologique et peut aussi être mis en évidence chez les filles de service de radium. L'état du sang est nettement amélioré après un long congé. Des moyens améliorés de protections sont recommandés de façon à diminuer les risques auxquels sont toujours exposés les personnes qui s'occupent de radiologie. Des examens du sang du personnel appartenant à l'institut des rayons X et du radium de l'Hôpital National, pratiqués longtemps après que les moyens de protection avaient été révisés et améliorés, montraient une amélioration considérable dans l'état du sang du personnel permanent.

RESUMEN

La sangre de los radiólogos y del personal que con ellos trabaja presenta siempre caracteres diferentes de la sangre normal.

El número absoluto de glóbulos blancos es muy a menudo inferior al término medio normal. La diferencia más acentuada es apreciable en la proporción de los leucocitos polinucleares y de los limfocitos: el porcentaje de los leucocitos se disminuye a la vez que aumenta el de los limfocitos (limfocitosis relativa). La cantitad de hemoglobina es casi siempre normal. El efecto sobre la sangre se observa ya desde el primer o segundo mes de trabajo radiológico, pudiéndose también notar en las chicas de servicio de radio. El estado de la sangre se mejora notablemente después de unas vacaciones largas. Los medios mejorados de protecciones se recomiendan de manera que disminuyan los peligros a los cuales están expuestas las personas que se ocupan de radiología. Los exámenes de la sangre del personal adscrito al Instituto de rayos X y de radio del Hospital National, practicados bastante tiempo después de que los medios de protección hubiesen sido revisados y perfeccionados, demostraron una mejoría considerable en el estado de la sangre del personal permamente.

FROM »RADIUMHEMMET», STOCKHOLM, CHIEF: PROFESSOR G. FORSSELL, AND PROFESSOR G. FORSSELL'S PRIVATE ROENTGEN INSTITUTE, STOCKHOLM

TO THE QUESTION OF POST OPERATIVE TREATMENT OF MAMMARY CANCER

by

T. Larsén (Assist. Physician) *Erik Lysholm* (Assist. Physician)

The post-operative Roentgen treatment of mammary cancer has long been considered beneficial both by surgeons and roentgenologists, and many have regarded it necessary. The subjective view has generally prevailed that to a certain extent this treatment was capable of counter-acting at least local recurrences. This view was based on the experience that it was possible to cure local recurrences by Roentgen treatment, and therefore it was thought that, if it was possible to check macroscopic cancer, there would be nothing inconsistent in the supposition that this treatment might also favourably influence microscopic cancer.

The reports published by PERTHES in the Centralblatt für Chirurgie, Jan. 1920, therefore came as a surprise, and an animated discussion for and against the prophylactic irradiation by Roentgen rays has been going on ever since.

PERTHES divides his material into four groups. The first group comprises 130 patients from the period 1910—1912. These have not been treated. The second group comprises 70 cases from the period 1913—1914, who have received one treatment of $^1/_2$ »full dose» on the cicatrix in the chest-wall through 3 millimeters of Al; the third group, 74 cases from the period 1915—16, who have had repeated treatments, the first time $^1/_2$ »full dose» and then usually five series after 4 weeks. Two areas treated: the breast and axilla. And the fourth group, 88 cases from 1917—1918, who have received an intense treatment, also 5 series with an interval of 4 weeks, the dose varying between $^2/_3$ to »full dose». Three areas treated: breast, axilla and supraclavicular fossa. Then an additional series after 3—6 months. The cases that have had no recurrences, are as

follows: After three years, group I, 36.5 %; group II, 30.5 %; and group III, 34 %. Already after one year the fourth group shows such a great number of recurrences that the result after the lapse of three years must be considerably worse than in the previous groups.

The comparison shows therefore that the number or recurrences have increased instead of decreased during the post-operative treatment, and, further, that they are most frequent in those cases that have been most intensely treated. PERTHES does not enter into any explanations of these statistics but considers that his material is too insufficient to allow of any definite opinion of this question, and he concludes by urgently recommending the German clinicians to follow closely the post-operatively irradiated cases, and to publish their results. Irradiations given by incompetent persons are, in his opinion, useless and not altogether without some risk.

KÖHLER (Centralblatt für Chirurgie, May 1920) has seen very sad results from an insufficiently standardized technic, but he does not give any figures. LEHMANN (Centralblatt für Chirurgie, March 1920) has for the last seven years employed a post-operative treatment. The number of cases with no recurrence has increased from 33 % to 47.5 % after a period of observation of three years. However, he has only from two to eight cases in each group, which fact makes his statements less valuable.

VON HOFFMANN (Centralblatt für Chirurgie, 1920) has been able to observe an improvement in his results, amounting to 10 %. He gives a very prolonged serial treatment with short intervals.

HALBERSTÄDTER (Krebsforschungsinstitut, Berlin) argues against PERTHES and criticizes his technic of irradiation, and he points especially to the fact that in several of PERTHES' cases a recurrence has occurred in the angle between two exposed areas, where there had not been any brown pigmentation of the skin, and where, in his opinion, a sufficient quantity of Roentgen rays had not been absorbed. HALBERSTÄDTER does, however, not produce any statistics but only discusses the question at issue.

At the Congress of Surgeons in Berlin 1921 the question was debated and the opinions differed greatly. SCHMIEDEN, EISELSBERG, and WARNEKROS pronounced for the post-operative treatment by Roentgen rays (SCHMIEDEN stated that he employed also a pre-operative treatment).

PAYR, TITZE and TICHY have abandoned the prophylactic post-operative treatment, partly on account of their personal experience and partly owing to PERTHES' report. VON DER HÜTTEN (Münch. med. Wochenschr.), too, speaks against a post-operative treatment.

He bases his opinion, however, on very small figures, 2—8 cases in each group, for which reason his statements become less valuable.

ANSCHÜTZ (Münch. med. Wochenschr.) presents some statistics which, with regard to the bulk and arrangement of the material, may be compared with those of PERTHES. For some time he has been interesting himself particularly in cancer of the breast and has kept a special journal in order to secure a more uniform appreciation of the cases. His material comprises 105 cases treated by Roentgen rays. Comparing the figures relating to the non-treated cases with the corresponding figures of PERTHES he considers the figures about comparable. After the Roentgen treatment the number of cases with no recurrence increases from 48 % to 60 % after a period of observation of three years, and from 36 % to 55 % after a period of observation of five years, thus showing an actual improvement in the results. If the material is divided into three groups according to STEINTHAL, the *first* group including only cases with a local non-adherent tumour, the *second* group including tumours with adhesions to the skin or pectoralis and with axillary glands, and the *third* group further including cases with glands in the supraclavicular fossa, the improvement will be apparent, especially in the second group. In his third group he has a slight increase of the number of cases free from recurrences after three years of observation, which result, however, is equalized after five years of observation. ANSCHÜTZ discusses the results and comes then to the conclusion that, as the bulk of his material is about the same as that of PERTHES, and as the results obtained without treatment also are fairly equal, the increase in the number of cases with no recurrences after the post-operative exposures to Roentgen rays must be due to the treatment and more particularly to the technic employed. He worked with comparatively small doses, according to the Erlangen nomenclature $^2/_3$ H. E. D. on three areas, one large area over the thorax, one over the supra- and infraclavicular fossae and one over the posterior axillary fold. As a compensation for the small doses he repeats the whole series of treatments as much as eight times in one year. In case of a recurrence he gives similar series, and he states he has seen a fair number of cases where growths and glandular recurrences have disappeared during this treatment. He states further that he has also made skin metastases disappear in this way. He uses LILIENFELD apparatuses and a filter of three millimeters of aluminium.

Below is given a short account of the final results obtained in the post-operatively treated cases from the Roentgen Institute of Professor FORSSELL and from »Radiumhemmet». The materials from

these two clinics have been thrown into one, which step has been deemed well grounded, partly because the total material is thereby increased, and partly because the technic which has been fixed by FORSSELL, has been the same at both places. In developing the technic of this treatment FORSSELL worked on the basis of the experiences he had gained when treating mammary cancer with manifest skin metastases. And the technic became the same as the one he has here found to have given favourable results in some cases. He gave four to five series according to the condition of the skin, the first ones at intervals of four to five weeks, then at longer intervals.

In each series a total dose averaging 50 H. through 3 mm. of aluminium was given, and on each field three irradiations of about 5 H (i. e. about one third of an erythema skin dose) in each series. The skin focus distance was 24 cm. The tubes were running with $1^1/_2$—2 milliampères and 35—38 centimeters spark gap (point and plate). Over the thorax usually three or four areas were exposed, with different focal arrangements and without any covering of the surrounding surface, the exposed areas being restricted in some cases. As a rule, the glandular areas were also treated, a filter of 0.5 millimeters of copper being employed in some cases. Usually the patient got a faint reddening and brown pigmentation with slight skin atrophy. Telangiectasis developed in some cases.

This method of treatment limits, thus, intentionally the direct degenerating effect of the irradiation to the skin and to the subcutaneous tissue as well as to the immediately subjacent tissue layers.

The object has been to find whether any conclusions could now be drawn or, should this not be possible, to try to find some definite indications for the continuation of the work.

The total number of cases treated by this technic amounts to 76. Only such cases have been included on which a macroscopically radical operation has been performed, and where the patient has not exhibited any clinical signs of recurrence at the commencement of the treatment. All 76 cases have been treated in 1918 and 1919 and have been under observation for at least three years. At the end of this period fortyseven of them, or 60 per cent, of the entire material, were alive and had no probable recurrences.

If we divide the material into groups in the manner of STEINTHAL, the first group will comprise 26 cases, all of them without recurrence, the second group, 35 cases, of which 24 (68 %) have had no recurrence, and the third group, 15 cases, of wich only 1 (6.5 %) has had no recurrence.

From these statistics it is of course impossible to draw any definite conclusions as to the value of the post-operative treatment by Roentgen rays. Our material has a feature common to all cancer statistics, namely, that the variations in the material as well as the degrees of malignancy of the cancer growths evade our estimation. It is quite certain that these patients have not fared worse by this technic than they would have fared, had they not been treated at all. And it seems probable that local recurrences have been forestalled in some of the cases. A continued treatment by this technic seems at any rate permissible. However, careful observations of a more numerous material are necessary to ensure certainty as to these problems and to improve the technic eventually. Since the beginning of 1923 carefully drawn up blanks for the patients have been introduced at the institutions that are under the controll of Professor FORSSELL (Radiumhemmet, The Roentgen Institute of the Seraphimer Hospital, and his own private institute).

As a comparison to the figures given above it may be stated that the Swedish Cancer Statistics, arranged by the Swedish Cancer Society and published by Professor G. NYSTRÖM (Surg. Clin., Uppsala) in 1922, show an absence of recurrences varying between 23 and 33 per cent. of the operated cases five years after the operation.

A different Roentgen technic was employed in 1920. The object was not to limit the effect of the irradiation to the skin and the tissue immediately subjacent to it, but to give the whole region a sterilizing deep-dose by exposing homogenously the breast and the glandular region with the aid of the technical resources then at disposal. The exposure of the skin was so strong as to very nearly producing desquamation of the epithelial layer.

However, this technic was given up already within one year, as FORSSELL had the feeling of being on the wrong track mostly because of the bad results that were obtained coincidentally with this technic in the treatment of some cases of apparent tumours of the breast. When examining the material one year later, it was found that the abandoning of this technic might be considered well-grounded. Out of thirty-three cases treated only sixteen cases without recurrences were alive after one year, which is a very high figure for recurrences, and if one divides the material into the STEINTHAL groups, one will find a higher figure of recurrence in the first as well as in the second group.

Of course, the material is even here too insignificant, but there seems to be good reason to suppose that a series of treatments with large doses applied to large areas is not to be recommended, which fact also seems to be apparent from the statistics of PERTHES.

SUMMARY

After having given a brief review of the literature published by PERTHES and others on the results of the preventive post-operative treatment in mammary cancer, the writers present the results of this treatment in 109 cases treated by Professor FORSSELL.

Seventy-six cases, all of which have been under observation for at least three years, have been treated with several series of small doses delivered through a filter of 4 millimeters of aluminium. Out of these 76 cases 47 (= 60 %) are alive, and have had no provable recurrence.

Of 26 cases with a local non-adherent tumour all have been without recurrence.

Of 35 cases with adherent tumours or axillary glands 24 (= 68 %) have been free from recurrences.

Of 15 cases with glands in the supraclavicular fossa 1 only (6.5 %) has had no recurrence.

Out of 33 cases irradiated with large single doses (1920) and deep-therapy only 16 cases were alive and without recurrence after one year, and in all groups there has been a higher frequency of recurrence by this technic than by series of smaller doses.

ZUSAMMENFASSUNG

Nach einem kurzen Bericht über die in der Literatur von PERTHES und andern publizierten Resultate der präventiven postoperativen Therapie des Mammakarzinoms, teilen die Verff. die Ergebnisse dieser Behandlung bei 109 von Professor FORSSELL behandelten Fällen mit.

Sechsundsiebzig Fälle, alle nachher mindestens 3 Jahre in Beobachtung, waren mit verschiedenen Serien kleiner, durch ein Filter von 4 mm Aluminium verabreichter Dosen behandelt worden. Von diesen 76 Fällen sind 47 (= 60 %) am Leben und haben keine nachweisbare Rezidive gehabt.

Von 26 Fällen mit einem lokal nicht adhärierenden Tumor waren alle rezidivfrei.

Von 35 Fällen mit adhärenten Tumoren oder Achseldrüsen hatten 24 (= 68 %) keine Rezidiven.

Von 15 Fällen mit Drüsen in der Fossa supraclavicularis blieb nur 1 (6.5 %) von Rezidive verschont.

Von 33 Fällen, die mit grossen Einzeldosen (1920) und Tiefentherapie qestrahlt waren, lebten nach einem Jahr nur 16 Fälle ohne Rezidive und in allen Gruppen bestand bei dieser Technik eine grössere Frequenz an Rückfällen als bei Serien von kleineren Dosen.

RESUMÉ

Après avoir donné un aperçu succinct de la litérature publiée par PERTHES et d'autres sur les résultats du traitement préventif post-opératoire dans le

cancer mammaire, les auteurs exposent les résultats acquis par ce traitement dans 109 cas traités par le Professeur FORSSELL.

Soixante-seize cas dont tous ont été sous observation pendant au moins trois ans, ont été traités avec plusieurs séries de petites doses, administrées à travers un philtre de 4 mm. d'aluminium, 47 sur ces 76 cas (60 %) sont vivants et n'ont eu aucune récidive probable.

Sur 26 cas avec tumeurs locales non adhérentes, aucun n'a eu de récidive.

Sur 35 cas avec tumeurs adhérentes ou avec ganglions axilaires infectés 24 (68 %) n'ont pas eu de récidives.

Sur 15 cas avec ganglions infectés dans la fosse susclaviculaire, 1 cas seulement (6.5 %) n'a pas eu de récidive.

Sur 33 cas ayant reçu de fortes doses uniques (1920) et en profondeur, 16 cas seulement étaient vivants et sans récidive après un an, et dans tous les groupes cette technique a été suivie d'une plus grande fréquence de récidives que celui consistant en séries de plus petites doses.

RESUMEN

Después de dar una suscinta relación de la literatura publicada por PERTHES y por otros sobre los resultados del tratamiento preventivo postoperatorio en el cancer mamario, los autores exponen los resultados obtenidos por este tratamiento en 109 casos tratados por el Profesor FORSSELL.

Setenta y seis casos, todos ellos en observación durante tres años por lo menos, han sido tratados con varias series de pequeñas dosis, administradas a través de un filtro de 4 m.m. de aluminio, 47 de estos 76 casos (60 %) se encuentran en vida y no tuvieron ninguna reproducción probable.

De 26 casos, con tumores locales no adherentes, ninguno se reprodujo.

De 35 casos, con tumores adherentes o con los ganglios axilares infectados, 24 (68 %) no tuvieron reproducción.

De 15 casos con los ganglios infectados en la fosa subclavicular tan sólo un caso (6.5 %) no se reprodujo.

De 35 casos tratados con fuertes dosis únicas (1920) y profundas, tan sólo 16 casos se encontraban con vida y sin reproducción al cabo de un año, y en todos los grupos esta técnica ha sido seguida de una mayor frecuencia de reproducciones que en la consistente en series de dosis más pequeñas.

AUS DER STAATLICHEN RÖNTGENKLINIK IN REYKJAVIK, ISLAND
VORSTAND: DR. G. CLAESSEN.

RADIOLOGISCHE BEHANDLUNG GEWISSER FORMEN CHIRURGISCHER TUBERKULOSE

von

G. Claessen

Wenn die Radiotherapie für die Behandlung chirurgischer Tuberkulose auch bereits durch eine Reihe von Jahren von den Ärzten zur Anwendung gebracht worden ist, kann man nicht behaupten, dass die Ansichten auf diesem Gebiete feste Formen angenommen haben; es herrscht noch immer Uneinigkeit in bezug auf die Methoden und Erfolge. Man muss die Wahl der Lichtquelle als einen der grundsätzlichen Punkte in der Behandlung ansehen. Nicht nur, dass die Aussichten für den Patienten davon abhängen, welche Strahlenqualität man verwendet, die Sache hat ausserdem eine grosse wirtschaftliche Bedeutung, da die Kosten für die Anschaffung und den Betrieb der verschiedenen Einrichtungen in hohem Grade variieren. Jedes Jahr werden Apparate zur Lichtbehandlung in öffentlichen und Privatkliniken neu aufgestellt und der Arzt, der nicht selbst die nötigen Erfahrungen besitzt, muss daher in Zweifel geraten, welche Einrichtung er wählen soll.

Will man universelle Lichtbäder verabreichen, so hat man die Wahl zwischen Quarz- oder Bogenlampen. Auf unserer Klinik wurden erst vor einem Jahre Bogenlichtlampen aufgestellt, während wir vorher mit Quarzlampen für allgemeine Lichtbäder in Verbindung mit lokaler Röntgen- und Radiumbehandlung gearbeitet haben. Die folgende Mitteilung will einen Beitrag zur Frage liefern, welche Erfolge bei gewissen Formen chirurgischer Tuberkulose bei Anwendung einer derartigen radiologischen Behandlung erzielt werden können.

Es muss strenge zwischen dem *generellen Lichtbade und der lokalen Bestrahlung geschieden werden.* Bei ersterem bezweckt man eine Wirkung auf den ganzen Organismus, während auf die Bestrahlung des kranken Organs kein besonderes Gewicht gelegt wird. Dass beim Lichtbade eine indirekte Einwirkung auf tuberkulöse Herde erzielt werden kann, darüber besteht wohl kein Zweifel (1) Ausser den

sichtbaren klinischen Veränderungen im Zustande der Patienten müssen die Resultate als beweisend betrachtet werden, welche durch das Lichtbad bei Kranken erzielt worden sind, bei denen die angegriffenen Stellen gegen die Lichtstrahlen vollständig bedeckt waren. Bei der lokalen Bestrahlung wird eine direkte Einwirkung auf die tuberkulösen Herde angestrebt. Wie erwähnt, wurde bei den angeführten Patienten die Quarzlampe zu universellen Lichtbädern und Röntgen- nebst Radiumbehandlung zur lokalen Behandlung in Verwendung gebracht. Einige der Patienten bekamen kombinierte Behandlung, während andere nur mit einer Art von Strahlen behandelt wurden. Zur Ergänzung des Quarzlichtes wurden teils Hagemanns *Glühlampen* teils *Sollux*lampen angewendet; diese Lichtquellen haben unter anderem den Vorteil, dass sie den Patienten während des Lichtbades, welches 4 mal der Woche verabreicht, $1^1/_2$—2 Stunden dauerte, warm halten.

Zur Röntgenbehandlung wurde Müllers Siederöhre und ein 35 cm-Induktor mit Gasunterbrecher (Durixapparat) verwendet. Als Filter in der Regel 4 mm Aluminium, die Dosen 5—10—15 H, jedesmal soweit als möglich mehrere Einstellungen, besonders wo es sich um grössere Drüsengeschwülste handelte.

Zur Radiumbehandlung wurde Radiumsulfat in Platintuben, durch 2 mm Blei filtriert benützt.

Ich beabsichtige nicht alle Fälle aufzuzählen, welche im Laufe der letzten Jahre in klinische Behandlung genommen worden sind, sondern will nur von jenen Formen der chirurgischen Tuberkulose sprechen, welche sich meiner Ansicht nach zur radiologischen Behandlung mit den Apparaten und der von mir beschriebenen Technik geeignet erwiesen. Es sei jedoch bemerkt, dass die Therapie mit universellem Quarzlicht und lokaler Behandlung in verschiedenartigen Fällen bei Tuberkulose mittelgrosser Gelenke nicht geringe Erfolge gezeitigt hat. Wenn man aber auch bei vielen Patienten ein positives Resultat erzielt, sehr oft gelangt man nur bis zu einem gewissen Stadium auf dem Wege zur Heilung, während die definitive Heilung ausbleibt.

Die Formen chirurgischer Tuberkulose, über welche ich berichten will, sind folgende:

1. Lymphadenitis tuberculosa
2. Abscessus subcutaneus und Ulceratio tuberculosa
3. Spina ventosa.

Die Patienten der Gruppe 2 und 3 wurden ausschliesslich mit universellem Quarzlichtbad behandelt, während die Patienten der Gr. 1 ausserdem lokale Röntgen- und Radiumbehandlung erhalten haben. Die Behandlung geschah 1918—21.

Medical Science Department

	Anzahl	Krankheitsdauer mehr als 1/2 Jahr	Kompliziert m. Fistel u. Abszess	Besserung	Heilung	Mehr als 1/2 Jahr kontrolliert	Rezidiv
1. Lymphadenitis tuberculosa	90	—	50	22	67	55	6
2. Abscessus subcutaneus & Ulceratio tuberculosa	73 (15)	10	—	—	73 (15)	73 (15)	(2)
3. Spina ventosa	10 (7)	4	4	—	10	10	0

Lymphadenitis tuberculosa. 90 Patienten, hiervon 50 mit Abszess oder Fistel. 22 gebessert, 67 relativ geheilt, 1 unverändert. 55 durch mehr als 1/2 Jahr in Beobachtung, 6 hiervon bekamen Rezidiven. Diese Zahlen bedürfen einer näheren Erklärung, da 62 ausschliesslich Röntgen- oder Radiumbehandlung erhielten, während die übrigen Patienten mit Lichtbädern behandelt worden sind, daneben mit lokaler Behandlung oder ohne solche. Von den 62 nur lokal behandelten Patienten wurden 41 geheilt, hiervon 33 kontrolliert, mit 3 Rezidiven. Die Fälle waren in der Regel recht schwer, da man in leichteren Fällen ohne Strahlenbehandlung auszukommen trachtet. Einige der Patienten hatten faustgrosse Drüsengeschwülste und, wie bereits erwähnt, mehr als die Hälfte waren mit Fistel oder Abszess kompliziert. Als relativ geheilt bezeichne ich die Fälle, in welchen Abszesse und Fisteln geheilt wurden, beziehungsweise die Lymphome entweder vollständig verschwanden oder bedeutend an Grösse abnahmen, ohne später Neigung zu erneutem Wachstum zu zeigen.

Man gewinnt den Eindruck, dass kein besonderer Unterschied zwischen dem Einflusse der Röntgen- und Radiumstrahlen auf das tuberkulöse Drüsengewebe besteht. Radium hat den Übelstand, dass man recht grosse Quantitäten des Stoffes haben muss, um eine grosse Partie auf einmal bestrahlen zu können und auch die Behandlungsdauer ist recht lang. Dagegen hat das Radium den Vorteil, dass es bei kleinen Kindern mit tuberkulösen Lymphomen leicht anwendbar ist, während es infolge ihrer Unruhe bei manchen Fällen ganz unmöglich werden kann, sie einer Röntgenbehandlung zu unterziehen.

Die Fälle mit tuberkulösen Lymphomen, auf die hier Bezug genommen ist, sind insoferne nicht rein, als sie kombiniert behandelt wurden, während die im folgenden angeführten Fälle nur universelle Lichtbäder mit Quarzlampe bekommen haben.

Abscessus subcutaneus. Fistula et Ulceratio tuberculosa 73 Fälle bei 15 Patienten. Die Tuberkulose war ausschliesslich in den Weichteilen lokalisiert, *ohne Beteiligung der Lymphdrüsen*, und in *keinem*

der Fälle war es möglich einen *Knochenprozess* festzustellen. Nur bei einem Patienten handelte es sich um eine geschlossene Tuberkulose, alle anderen Patienten hatten offene Affektionen. Diese Form der äusseren Tuberkulose ist recht eigenartig, da es in manchen Fällen sehr ausgebreitete ulzerative Prozesse waren, welche durch mehrere Jahre bestanden und sich einer wiederholten chirurgischen Behandlung gegenüber refraktär verhalten hatten.

Zur Beleuchtung des Zustandes der Patienten mögen folgende Krankengeschichten dienen.

1. S. Th. 27 J. Landwirt. Die Krankheit begann im 3. Lebensjahre; durch 24 Jahre litt Patient ohne Unterbrechung an eitrigen, tuberkulösen Prozessen an Hals, Stamm und Extremitäten. Nie ein Knochenprozess festgestellt. Wiederholte chirurgische Behandlungen konnten die Fisteln nicht dauernd zur Heilung bringen. Bei der Aufnahme in die Klinik hatte der Patient an 19 verschiedenen Stellen des Halses, Stammes und der Extremitäten Abszesse und Fisteln; die meisten Fisteln waren sehr tief und der grösste der Abszesse war so gross wie eine Apfelsine.

Am $^1/_6$ 1920 wurde mit universellen Quarzlichtbädern begonnen und zu Anfang Dezember dieses Jahres waren alle Abszesse und Fisteln geheilt; an einzelnen Stellen wurde Evidement gemacht. Der Patient stellte sich $1^1/_2$ Jahre später vor, hatte da seit 2 Monaten zwei oberflächliche Fisteln am Halse; die anderen Fisteln und Abszesse blieben geheilt.

2. E. J. 15 J. Bauernknecht. Im Alter von 5 Jahren Exstirpation des einen Zeigefingers und des dazu gehörenden Metakarpusknochens. Seither ständig Fisteln an Stamm und Extremitäten, trotz wiederholter chirurgischer Behandlung. Kam am $^2/_7$ 1918 mit Fisteln an 9 verschiedenen Körperstellen und mit zahllosen Narben auf die Klinik. Ende November d.J. waren alle Fisteln geheilt und der Patient blieb seither ohne Rezidive.

3. K. M. 19 J. Landwirt. Keine tuberkulöse Veranlagung; früher gesund. Hatte durch einige Monate Fisteln auf der Brust. Kam am $^{22}/_7$ 1918 auf die Klinik. Die Vorderfläche der Brust war zum grossen Teile durch reichlich sezernierende Fisteln unterminiert. Heilung im Jan. 1919. Später keine Rezidive.

4. H. H. 13 J. Seemannskind. Keine tuberkulöse Veranlagung; als Kind nicht skrofulös. Seit $1^1/_2$ Jahren Beulen und Fisteln am rechten Arm und linken Fuss, wo eine Zehe exstirpiert worden war; ausserdem mehreremal Evidement. Aufgenommen am $^{12}/_6$ 1918, mit 8 Fisteln in den genannten Gegenden, u. a. in der Narbe nach der erwähnten Operation; ausserdem am linken Femur. Heilung aller Geschwüre medio Oct. 1918, ohne spätere Rezidive.

Wie in diesen Krankengeschichten angeführt ist, handelte es sich bei einigen dieser Patienten um vieljährige fistulöse Prozesse; einer derselben hatte Geschwüre und Fisteln durch 24 Jahre! Diese eigentümlichen Formen der äusseren Tuberkulose können demnach durch viele Jahre bestehen, ohne weiteren Einfluss auf den Allgemeinzustand zu haben; dieser war bei allen Patienten gut. Sie waren durchwegs afebril, zum Teil auch arbeitsfähig, bei mehreren von ihnen handelte es sich jedoch um einen gewissen Grad psychischer De-

pression, was ja leicht verständlich ist. Die Patienten scheinen gegenüber der Tuberkulose sehr widerstandsfähig zu sein, da zu einer Verbreitung auf die inneren Organe im Laufe der langen Dauer gewiss vielfach Gelegenheit gegeben war. Alle dieser Gruppe angehörenden Patienten erholten sich unter der Lichtbadbehandlung und nur bei einem von allen kam es 1/2 Jahr nach Abschluss der Behandlung zu einer Rezidive. Späterhin hat sich ein Patient mit kleiner Rezidive nach 1 1/2 Jahren vorgestellt. Ein Patient bekam 3 Jahre später eine tuberkulose Peritonitis.

Spina ventosa. 10 Fälle bei Patienten im Alter von 1—14 Jahren. Lokalisation: Metatarsus, Metacarpus und Phalangen. Bei vier von den Patienten hatte das Leiden 1/2 Jahr gedauert, ehe die Lichtbehandlung begonnen wurde und in ebensovielen Fällen war ein Abszess oder eine Fistel vorhanden, mit Abgang von Sequestern bei 2 Patienten. Alle wurden vollständig geheilt, ohne spätere Rezidive. Zur Beleuchtung der Fälle will ich einige Krankengeschichten mitteilen:

D. J. 6 Jahre alte Seekapitänstochter. Kam am 19/5 1921 auf die Klinik. Keine Anlage für Tuberkulose. Seit 5 Monaten eine Geschwulst der 5. Zehe des linken Fusses; Patientin konnte sich in den letzten 2 Monaten nicht auf den Fuss stützen. Vor 6 Wochen bildete sich ein Abszess, der inzidiert wurde, es kam zu einer Fistel. Die betreffende Zehe stark geschwollen, ebenso der entsprechende laterale Rand des Fusses mit Fistel des Metatarsophalangealgelenkes. Ausserdem kalte Abszesse am Medialrand desselben Fusses, der l. Wange und in der Parietalgegend. Patientin wurde mit Quarzlichtbädern in Behandlung genommen. Am 1/8 beobachtete man einen Sequester in der Fistel des linken Fusses. Er wurde extrahiert und erwies sich als die Grundphalanx der 5. Zehe. Radiumapplikation auf die linke Wange. Am 9/9 1921 alle Fisteln und Abszesse geheilt. Kein Hindernis beim Gehen. Seither rezidivfrei.

Th. M. 11 Monate alter Knabe. Kam am 11/1 1918 in Behandlung. Mutter phtisisch. Seit 2 Monaten Geschwulst des linken Zeigefingers. Grosse fluktuierende Spina ventosa über der 1. und 2. Phalanx dieses Fingers mit Durchbruch nach der Dorsal-und Volarseite. Ferner Spina ventosa auf den Grundphalangen des 2. und 5. Fingers der rechten Hand, kalte Abszesse auf der linken Wange, beiden Vorderarmen und dem rechten Oberschenkel. Patient hatte Bronchitis. Quarzlampenbad. 14/3 ein Sequester in der Fistel des linken Zeigefingers, bei der Extraktion erweist er sich als das distale Ende der 2. Phalanx mit dem zugehörenden Gelenksknochen. 20/5 waren die Fisteln, durch welche der Sequester abging, geheilt; geringe Deformität. Normale Funktion. Die übrigen Finger ebenfalls normal. Die Abszesse, welche auch chirugisch behandelt worden sind, ebenfalls geheilt am 14/8 1918. — Später rezidivfrei.

K. J. 14 J. Bauernsohn. Kam am 14/8 1919 in Behandlung. Keine tuberkulöse Anlage. Keine Skrofulose. Im Jahre 1918 Trauma des linken Fusses durch hartes Aufstossen gegen einen Stein. Distorsion desselben Fusses im Frühjahr 1919, seither zunehmende Geschwulst des Fusses, vor einigen Tagen Perforation eines Abszesses am Fussrücken. Kann sich nicht

auf den Fuss stützen, geht mit Krücke und Stock. Man findet eine bedeutende Schwellung des l. Fussrückens und in der Mitte eine grosse, stark sezernierende Geschwulstbildung. Im Röntgenbilde Periostitis ossis metatarsi III. pedis sin. Auf Quarzlichtbad nahm die Geschwulst nach einiger Zeit ab, ebenso die Empfindlichkeit. Am $^{31}/_{3}$ 1920 war die Ulzeration verheilt, weder direkt noch indirekt empfindlich. Bei der Entlassung, Mitte Juni, geht er mit Hilfe eines Stockes ohne viel Beschwerden. Nach weiteren Nachrichten begann er bald sich an der Feldarbeit zu beteiligen und war hernach vollkommen gesund.

Die Dauer der Quarzlichtbehandlung war 3—10 Monate, durchschnittlich 6 Monate. Bei einigen der Patienten wurden die Lichtbäder vorsichtshalber länger als notwendig fortgesetzt. Trotz Knochenzerstörung war die Funktion nach der Heilung ideal. Ich glaube nicht, dass es je notwendig sein wird, wegen Tuberkulose Finger oder Zehen zu amputieren; in allen Fällen ist es ein *grober Kunstfehler, wenn man an Händen oder Füssen verstümmelnde Operationen vornimmt, bevor man den Patienten nicht einer gründlichen universellen Lichtbadbehandlung unterzogen hat.*

Lupus vulgaris in der Umgebung von Fisteln. In den meisten Handbüchern wird angegeben, dass der Lupus öfters in der Umgebung von Fisteln, von Ostitis tuberculosa und fistulöser Drüsentuberkulose entsteht.

Aus England finden sich Mitteilungen über Hautinfektionen in der Umgebung tuberkulöser Fisteln von Sequeira (2), aus Deutschland von Lesser (3) und aus Dänemark von dem Finsenschen medicinischen Lichtinstitut (4). Ernst (5) schreibt: «Die Fisteln und Narben nach ihnen sind fast immer mit lokaler Lichtbehandlung behandelt (das konzentrische Finsenlicht) und wir haben grosses Gewicht darauf gelegt, weil wir so oft Patienten zur Behandlung bekamen mit schwerem Lupus, der von einer alten tuberkulösen Fistel ausgegangen war.»

Aus Angst vor einem eventuell entstehenden Lupus hält man die Lokalbehandlung der Fisteln für notwendig, was die Arbeit enorm steigert. Lupus variiert bekanntlich in den verschiedenen Ländern sowohl bezüglich seiner Häufigkeit als auch seiner Bösartigkeit; auf Island ist die Krankheit nicht häufig, trotz der recht grossen Verbreitung der Tuberkulose. Bei den Patienten mit fistulöser äusserer Tuberkulose, welche in meiner Behandlung standen, sind von den Fisteln ausgehende Fälle von Lupus nie vorgekommen, ebensowenig können die Chirurgen und Lungenheilstättenärzte des Landes Fälle dieser Art mitteilen. Diese Komplikation scheint nicht vorzukommen und es beruht dies wohl auf der Widerstandskraft der Haut der Bevölkerung. Wenn die Sekretion seitens der tieferen Teile aufhört, pflegen die Fisteln ohne lokale Behandlung zu heilen, so

dass ich nie Veranlassung hatte dieselben aus diesem Grunde einer besonderen Lichtbehandlung zu unterziehen. Einigemale musste man eine Auskratzung der Granulationen in den Fisteln vornehmen.

Chirurgie und Lichtbehandlung. Eine sachkundige chirurgische Behandlung hat in Verbindung mit der Lichtbehandlung eine grosse Bedeutung. Bei den oben mitgeteilten Formen der äusseren Tuberkulose glaube ich, dass die Lichtbehandlung absolut am Platze ist, deshalb darf jedoch die chirurgische Seite nicht versäumt werden. Die alte Regel «ubi pus ibi incide» behält, selbst wenn die Patienten der Lichtbehandlung unterzogen werden, ihre Giltigkeit. Man wird deshalb Abszesse eröffnen oder punktieren, falls sie nicht Neigung zur spontanen Resorption zeigen. Einige der Patienten mit Weichteiltuberkulose haben lange und gewundene Fisteln und Höhlen, welche nach einfachem Aufschneiden heilen werden, unter Lichtbehandlung in bedeutend kürzerer Zeit als sonst; natürlich muss man auch auf das kosmetische Resultat Rücksicht nehmen und sich danach richten.

In seiner grossen Arbeit über Heliotherapie beschreibt Rollier (6, 7) die spontane Ausheilung von Knochensequestern und rät die Abstossung der Sequester nicht durch chirurgische Nachhilfe zu beschleunigen. Die Behandlung der chirurgischen Tuberkulose ist aber in der Regel sehr langwierig und man ist es den Patienten schuldig, sie so sehr als möglich abzukürzen. In mannigfachen Fällen bleiben die Fisteln nur aus dem Grunde offen, weil noch Sequester vorhanden sind und es erscheint mir deshalb einleuchtend, dass man sie entfernen soll, wenn dies in schonender Weise geschehen kann; wenn sie sich so weit als möglich gelockert haben, so dass sie in der Fistelöffnung erscheinen, ist ihre Entfernung in der Regel leicht und ohne Risiko für den Patienten. Bei Lymphadenitis tuberculosa sieht man ebenfalls, dass sich die nekrotischen Teile wie eine Art Sequester verhalten und die Eiterung fördern; durch einen leichten chirurgischen Eingriff können die Lymphome leicht entfernt werden und ein Evidement des nekrotischen Drüsengewebes wird daher in vielen Fällen angezeigt erscheinen. Da in dieser Mitteilung nur ein begrenztes Gebiet der Lichtbehandlung der äusseren Tuberkulose zur Besprechung kommt, will ich auf die Notwendigkeit, die chirurgische mit der Strahlentherapie zu verbinden, nicht eingehen und möchte nur bemerken, dass, wenn der Radiolog nicht ein ausgebildeter Chirurg ist, er eine sachkundige chirurgische und orthopädische Assistenz zur Seite haben muss.

Die Indikation der generellen oder lokalen Behandlung. Die Frage, ob man generelle Lichtbäder oder örtliche Behandlung anwenden soll, ist sehr interessant und aus wirtschaftlichen Gründen für die

Patienten sehr wichtig. Es ist einleuchtend, dass langdauernde Lichtbäder, 3—4 mal die Woche, viel zeitraubender und teuerer sind als lokale Röntgen- oder Radiumbestrahlungen in längeren Zwischenräumen. Es ist eine bis zur Trivialität wiederholte Lehre, dass eine äussere tuberkulöse Manifestation nur als ein Symptom eines Allgemeinleidens anzusehen ist; die theoretische Richtigkeit darf man nicht leugnen und, streng genommen, sollte man eigentlich alle Patienten mit äusserer Tuberkulose mit universellem Lichtbad behandeln. In der Praxis nimmt sich jedoch die Sache anders aus. Es geschieht gar nicht so selten, dass man z. B. einen Patienten mit einer grossen Drüsengeschwulst am Halse sieht, ohne dass der Betreffende in irgend einer Weise den Eindruck machen würde, dass er an einer allgemeinen Erkrankung leide; er ist arbeitsfähig, fiebert nicht und hat auch sonst keine Allgemeinsymptome. Wenn die tuberkulöse Lymphadenitis sich klinisch wie eine örtliche Krankheit verhält, ohne zu Allgemeinsymptomen Anlass zu geben, dann, glaube ich, soll man sich mit der lokalen Bestrahlung begnügen. Wenn der Patient dagegen für Tuberkulose veranlagt ist, an mehreren Stellen des Lymphdrüsensystems Zeichen von tuberkulösen Vorgängen darbietet, anämisch ist, Tendenz zu Temperatursteigerungen zeigt, werden Lichtbäder, eventuell kombiniert mit örtlichen Bestrahlungen am Platze sein. Es sind nach den Mitteilungen von Iselin (8) und mehrerer anderen Autoren durch Röntgenbehandlung der Tuberkulose der Knochen und Weichteile zweifellos gewisse Erfolge erzielt worden, aber die Erfolge auf unserer Klinik deuten doch daraufhin, dass man bei Spina ventosa und Weichteiltuberkulose absolut universelle Lichtbäder empfehlen soll.

Einige meiner Patienten haben lokale oder allgemeine Sonnenbäder erhalten. Diese Behandlung wurde jedoch durchaus nicht systematisch durchgeführt und nur hie und da angewendet. Platzverhältnisse und die klinischen Einrichtungen haben Sonnenbäder in grösserem Masse nicht zugelassen. Aber wenn man infolge der Witterung oder anderer Umstände auch nur eine begrenzte Möglichkeit zu dieser Behandlung besitzt, so glaube ich doch, dass man den Patienten raten soll, sich der Sonne, soviel als es die Verhältnisse gestatten, auszusetzen. Nicht wenige Patienten mit Lymphdrüsentuberkulose haben berichtet, dass der Zustand in der Regel im Sommer besser war als im Winter. Es ist hier keine ungewöhnliche Erfahrung, dass die Lymphome und andere tuberkulöse Prozesse in der zweiten Hälfte des Winters eine erhöhte Aktivität aufweisen, welche sich im Laufe des Sommers wieder bessert. Ich halte es für wahrscheinlich und natürlich, dass dieser Wechsel der Zustände mit den kurzen und lichtarmen Tagen des Winters im Gegensatze zur son-

nenreichen Periode des Sommers zusammenhängt. Ich empfehle den Patienten, soweit es sich mit ihrer Arbeit und ihren anderen Verhältnissen vereinen lässt, Luft- und Sonnenbäder als Nachkur. Wenn der Patient eine gegen den Wind geschützte Lage einnehmen kann, können Sonnenbäder bekanntlich auch im kalten Klima genommen werden. Besondere Anordnungen hierzu sind bekanntlich u.a. von BACKER (9) beschrieben worden, welche auch dort in Anwendung kommen können, wo die Terrainverhältnisse keine günstigen Bedingungen für Sonnenbäder bieten. Wenn man sich mit den Verhältnissen der Patienten vertraut macht, kann man ihnen vor ihrer Heimreise oft manchen praktischen Wink geben. Wenn z. B. ein Fischer einen windstillen ruhigen, sonnigen, Tag auf der See stilliegen muss, kann er ohne in seiner Arbeit gestört zu werden, die Gelegenheit zu einem ausgiebigen Sonnenbad für Hals und Schultern benützen und darauf kann man ihn aufmerksam machen. Der Patient, welcher durch 20 Jahre an tuberkulösen Geschwüren und Abszessen gelitten hatte, und dessen Krankengeschichte mitgeteilt worden ist, hat im Sommer nach seiner Entlassung aus dem Krankenhause an der Erntearbeit mitgeholfen; an sonnigen Tagen hat er nur mit einer Schwimmhose bekleidet gearbeitet, was am Lande leicht möglich ist, ohne Anstoss zu erregen, und befand sich dabei wohl.

Quarzlampen und Bogenlampen. Über die Wahl zwischen diesen beiden Lampenarten bestanden unter den Radiologen nicht geringe Meinungsverschiedenheiten. Die Einrichtung der Bogenlampen erfordert eine entsprechende Umformung der Lichtanlage, grossen Stromverbrauch, grosse gut ventilierte Räume und eine genaue Überwachung der Lampen während des Lichtbades, wogegen Quarzlampen, wenn bei der Bestellung darauf Rücksicht genommen wird, an jede Stromart angeschlossen werden können, mit geringem Stromverbrauch brennen, keine besondere Wartung benötigen, und in kleinen Räumen, ja selbst in der Wohnung des Patienten angebracht werden können. Es wäre daher ein offensichtlicher Vorteil mit Quarzlampen zu arbeiten, wenn man ebenso gute Erfolge erwarten könnte, wie von den Bogenlampen. Die letzteren hatten besondere Fürsprecher in den Radiologen des Finseninstitutes (5) und es darf nicht bezweifelt werden, dass die Bogenlampen tiefe tuberkulöse Affektionen stärker beeinflussen. Deshalb ist es jedoch sehr möglich, dass man bei mehr oberflächlich gelegenen Prozessen mit Quarzlampen zufriedenstellende Erfolge erzielt und meine Resultate deuten dahin, dass bei Spina ventosa, subkutanen Abszessen und Fisteln sowie teilweise bei tuberkulösen Lymphomen universelle Quarzlampenbäder gute Dienste leisten. Bogenlampen bei Spina ventosa an-

zuwenden, wie dies u. A. SINDING-LARSEN (10) empfiehlt, scheint mir nicht notwendig, keinesfalls als Normalmethode. Trotzdem auf unserer Klinik eine Bogenlampenapparatur angeschafft worden ist, werden die mehr oberflächlich liegenden Formen von chirurgischer Tuberkulose wie bisher mit Quarzlampen behandelt, in gewissen Fällen kombiniert mit lokaler Röntgen- oder Radiumbehandlung. Empfehlenswert wäre für eine gut eingerichtete radiologische Klinik, nicht zwischen der Anschaffung von Quarzlampe und Bogenlampe zu wählen, sondern beide Arten zur Verfügung zu haben und diese je nach den vorliegenden Fällen anzuwenden.

ZUSAMMENFASSUNG

Bei Anschaffung von Installationen zur Lichtbehandlung der chirurgischen Tuberkulose ist es wichtig, eine passende, wirkungsvolle Apparatur zu wählen, um gute Resultate zu erzielen; es besteht jedoch ein bedeutender Unterschied im Preis und den Betriebsbedingungen der verschiedenen Lampen.

Nach der Darstellung des prinzipiellen Unterschiedes zwischen Lichtbad und lokaler Bestrahlung werden die bei ambulanter Anwendung des Quarzlichtbades bei 3 Formen chirurgischer Tuberkulose erzielten Erfolge mitgeteilt.

1. Lymphadenitis tuberculosa, 2. Abszessus subcutaneus et Ulceratio tuberculosa und 3. Spina ventosa. Die Lymphome wurden ebenfalls zum Teil mit Röntgen und Radium behandelt. Die Erfolge der Behandlung sind so günstig, dass bei diesen Krankheiten stärkere Lichtquellen nicht notwendig sind.

Wenn auch Patienten mit äusserer Tuberkulose im allgemeinen an einer universellen Krankheit leiden, wird doch in Fällen tuberkulöser Lymphome, welche klinisch das Bild eines lokalen Leidens darbieten, die örtliche Behandlung für genügend erfolgreich angesehen. Sonst werden generelle Lichtbäder empfohlen.

Der Autor hat den in anderen Ländern auftretenden Lupus vulgaris in der Umgebung der Fisteln von knöchernen Herden oder Weichteiltuberkulose nie gesehen, auch andere Ärzte seines Landes haben keine solchen Fälle beobachtet.

Kleine chirurgische Eingriffe sind während der Lichtbehandlung notwendig: im Falle der Radiologe nicht selbst chirurgisch ausgebildet ist, benötigt er die Mitarbeit des Chirurgen.

Die Bogenlichtbehandlung ist bei den Fällen chirurgischer Tuberkulose, um die es sich in vorstehender Mitteilung handelt, nicht notwendig. Doch wird Bogenlicht bei manchen schweren Fällen von Lymphadenitis tub. sicher wünschenswert sein. Rücksichtlich der Frage, ob man sonst Bogenlicht oder Quarzlampen benützen soll, wird die Ansicht ausgesprochen, dass eine gut eingerichtete radiologische Klinik über beide Lampenarten verfügen soll, Quarzlampen für die mehr oberflächlichen Prozesse und Bogenlampen für die tieferen Lokalisationen der Tuberkulose.

SUMMARY

When procuring appliances for light treatment of surgical tuberculosis it is important to choose a suitable and effective apparatus so as to obtain good results. There exists, however, a great difference in the price and working conditions of the various lamps.

After giving an account of the chief differences between light baths and local irradiation the author proceeds to give a report on the results obtained by ambulant use of the quartzlight baths in three kinds of surgical tuberculosis.

1. Lymphadenitis tuberculosa, 2. Abscessus subcutaneus et Ulceratio tuberculosa, and 3. Spina ventosa. The lymphomata were also partially treated with Roentgen and radium. The results of the treatment are so favourable as to render a stronger source of light unnecessary in these diseases.

Even though patients with external tuberculosis generally suffer from a universal disease, the local treatment is considered sufficiently successful in cases of tuberculous lymphomata which present clinically the aspect of a local disease. General electric light baths are otherwise recommended.

The author has never seen the lupus vulgaris, which occasionally occurs in other countries, in the surroundings of the fistulae originating from tuberculous foci in the bones or in the soft parts, nor have such cases been observed by other physicians of his country.

Small surgical operations are necessary during the light-treatment: the roentgenologist, if not himself surgically trained, needs the co-operation of the surgeon.

The arc-light treatment is not necessary in those cases of surgical tuberculosis which have treated of above. The arc-light, however, will surely be desirable in many serious cases of lymphadenitis tub. With regard to the question whether arc-light or quartz-lamps ought to be employed the author expresses as his opinion that a well-equipped radiologic clinic should have at its disposal both kinds of lamps, the quartz-lamps for more superficial processes and the arcs for the more deeply situated tuberculosis.

RESUMÉ

Lorsqu'il s'agit de faire acquisition d'installations pour traitement à rayons lumineux de la tuberculose chirurgicale il est très important de choisir des appareils bein assortis et efficaces pour obtenir de bons résultats; il existe une différence remarquable dans le prix et les conditions d'exploitation des différentes lampes.

Après avoir exposé les différences essentielles entre bain de lumières et irradiation locale, l'auteur rend compte des résultats obtenus par l'emploi ambulant de bains de lumière — lampe de quartz à vapeur de mercure — dans trois sortes de tuberculose chirurgicale.

1° Lymphadenitis tuberculosa, 2° Abscessus subcutaneus et Ulceratio tuberculosa et 3° Spina ventosa. Les lymphomes furent par partie traités également avec des rayons X ou bien du radium. Les résultats obtenus par ce traitement sont si favorables que l'emploi de plus fortes sources de lumière était inutile pour ces maladies-là.

Quoiqu'en général des malades ayant des tubercules cutanés souffrent d'un état maladif général, un traitement local suffira pourtant dans les cas de lymphomes tuberculeux qui ont cliniquement l'aspect d'un mal local. Des bains de lumière sont recommandés dans les autres cas.

L'auteur n'a jamais observé le lupus vulgaris apparaissant souvent dans d'autres pays près des fistules de foyers osseux ou de tubercules dans la profondeur des tissus, ni d'autres médecins de son pays n'ont constaté de pareils cas.

De petites opérations sont nécessaires durant le traitement à rayons lumineux: dans les cas où le radiologue ne saura les faire, il devra être assisté par un chirurgien.

L'irradiation par lampes à arc n'est pas nécessaire dans les cas de tuberculose chirurgicale relatés dans ce mémoire. Cependant la lampe à arc est désirable dans certains cas graves de lymphadenitis tuberculosa. D'après l'avis de l'auteur une clinique radiologique bien pourvue devra disposer de lampes à vapeur de mercure pour les tubercules à la surface et de lampes à arc pour ceux localisés plus profondément.

RESUMEN

Cuando se trata de adquirir una instalación para el tratamiento por rayos luminosos de la tuberculosis quirúrgica es de una gran importancia la elección de aparatos adecuados y eficaces para obtener resultados satisfactorios; existe una gran diferencia en el precio y formas de empleo de las diferentes lámparas.

Después de haber expuesto las diferencias esenciales entre el baño de luz y la irradiación local, el autor da una relación de los resultados obtenidos con el empleo ambulante de los baños de luz-lámpara de cuarzo con vapores de mercurio — en tres diferentes clases de tuberculosis quirúrgica.

1. Lymphadenitis tuberculosa. 2. Abscessus subcutaneus y Ulceratio tuberculosa y 3. Spina ventosa. Les limfomas fueron parcialmente tratados por los rayos X o bien por radio. Los resultados alcanzados con este tratamiento resultan tan ventajosos que para el tratamiento de estas enfermedades resultaba inútil el empleo de fuentes luminosas más potentes.

Aunque en general los enfermos atacados de tuberculosis cutáneas se hallan en un estado general enfermizo, un tratamiento local resulta suficiente en los casos de limfomas tuberculosos, cuyo aspecto clínico sea el de una afección local. Los baños luminosos son recommendables en los demás casos.

El autor no ha observado jamás que el lupus vulgaris apareciese en otros países en las cercanías de las fosas óseas o de tubérculos en el interior de los tejidos, ni otros médicos de su país han podido tampoco apreciar casos semejantes.

Son necesarias pequeñas operaciones durante el tratamiento por rayos luminosos: en el caso de que el radiólogo no pueda afectuarlas deberá estar asistido por un cirujano.

La irradiación por lámparas de arco no es necesaria en los casos de tuberculosis quirúrgica relatados en esta memoria. Tambien la luz de arco debe ciertamente ser desirable in muchos graves casos de lymphadenitis tuberculosa. Según la opinión del autor, una clínica radiológica bien montada deberá disponer de lámparas de vapor de mercurio para los tubérculos superficiales y de lámparas de arco para los que se hallen localizados a mayor profundidad.

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DE L'INSTITUT CENTRAL DE RADIOLOGIE DE L'HÔPITAL DE LA VILLE VIENNE — CHEF-MÉDECIN: PRIM. D:r A. SCHÖNFELD

LE RADIO-DIAGNOSTIC DIFFERENTIEL DES DILATATIONS DU BASSINET RÉNAL

par

D:r *P. Smyrniotis*, médécin-volontaire, et D:r *F. Kraft*, assistant de l'institut

(Tabulæ I—II)

La pyélographie introduite par VOELCKER et LICHTENBERG en 1906 donne des résultats remarquables pour le diagnostic des maladies chirurgicales des reins, parce qu'elle nous ne renseigne pas seulement des dislocations de cet organ (congénitales et acquises) ou la localisation précise des calculs, mais elle nous permet aussi à connaître la configuration et l'état du bassinet. Ces circonstances et surtout le dernier jouent un grand rôle pour le diagnostic et il n'y a pas des autres méthodes meilleures qui nous aident à trouver les altérations si minutieuses, mais si importantes pour le malade et pour la thérapie. A cause de cette méthode l'opérateur peut maintenant se décider, si une opération soit nécéssaire ou non et quelle opération soit indiquée. C'est pour ça que les opérateurs et les urologues en profitant de ces avantages ne prennent pas le bistouri aujourd'hui sans avoir étudié le radiogramme du bassinet. Malgré cette grande importance de la pyélographie, principalement chez les cas des déformations du bassinet — si difficiles à diagnosticer sans pyélogramme — on ne trouve que des communications assez rares qui sont dispersées dans les journaux divers et surtout dans les journaux urologiques.

L'article suivant veut donner des renseignements surtout aux radiologues de ce qui est déjà indiqué au titre de ce travail et il veut aussi montrer les difficultés du diagnostic dans de cas divers et la résponsabilité du radiologue. Il se base à un nombre de plusieures centaines de pyélogrammes faits à l'institut au dessu nommé pendant 1913—1923 (juillet).

Avant de parler des diverses dilatations causées par des maladies differentes il est nécessaire à signer brévément les détails de la con-

figuration du bassinet normal avec ses variations physiologiques parce que la connaissance des types normaux est indispensable pour la distinction des pathologiques qui n'est pas si facile comme on le croit en général. Il faut avoir — au contraire — une grande experience pour distinguer un bassinet normal d'un autre qui se trouve au commencement de son altération.

Renseigné de ça nous regarderons les dilatations du bassinet et nous en donnerons une classification basée sur le diagnostic differentiel.

Enfin nous toucherons la technique de laquelle se dépend plusieures fois aussi le diagnostic.

1) BASSINET NORMAL

Les anatomes comprennent sous le nom «bassinet» seulement le sac où les calices — grands et petits — s'embouchent. Les radiologues et aussi les urologues usent l'expression «bassinet» pour toutes les cavités du rein, ces sont les calices et le sac où il se réunissent. Mais dans certains cas où est nécessaire à donner des renseignements plus détaillés, il est le coûtume de parler des calices et du bassinet, sous lequel on comprend le bassinet anatomique. On voit qu'il existe une seule expression — «bassinet» — pour deux choses, une fois pour le bassinet anatomique et l'autre fois pour les calices et le bassinet anatomique ensemble. Comme nous verrons plus tard, il y a des reins où les calices se réunissent avec l'uretère sans former un bassinet anatomique. Ce circonstance complique encore plus la difficulté à nommer les parties differentes des voies urinaires superieures, parce que chez ces cas le mot «bassinet» des radiologues n'exprime que les calices du rein. Cette confusion et inexactitude qui est parfois la cause d'une dissension mauvaise pour le malade, demande avec force une correction. Connaissant l'importance de l'exactitude à la médecine, nous avous cherché à trouver une expression nouvelle pour ce sac d'où l'uretère prend son origine. Alors, nous proponons à nommer cette partie «*ampoulle*». En disant bassinet nous comprenons les calices et l'ampoulle et dans ces cas, où l'ampoulle n'est pas développé, les calices et leur réunion avec l'uretère. Ainsi les mots «calices» et «ampoulle» sont réservés aux certaines parties des voies urinaires superieures.

Après cette distinction qui nous facilite à parler de cettes parties rénales sans être mal entendu, nous pouvons déjà commencer avec la déscription du bassinet normal, radiographé après injection du contraste.

Le bassinet normal se caractérise par deux signes:
1) par sa forme,
2) par sa capacité.

Quant à sa *forme*, on peut rencontrer deux grands types, desquels on peut séparer encore plusieurs sous-types. Nous distinguons
a) le type sans ampoulle
b) le type, où l'ampoulle est plus ou moins développé.

a) Bassinet sans ampoulle

Les Français l'appellent aussi «bassinet ramifié». On y voit que deux grands calices — plus rarement aussi plusieurs — s'embou-

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

chent directement à l'uretère. Le calibre des calices ne prend jamais une forme qu'on peut nommer ampoulle, il reste toujours le même et il ressemble beaucoup à celui-ci de l'uretère. Il est impossible de limiter le dernier des calices sur la plâque. Les figures 1 et 2 montrent les conditions de ce type.

b) Bassinet avec l'ampoulle

Ce type se trouve plus souvent que le premier. Au fin rénal de l'uretère que l'on peut bien définer à la plâque, nous voyons l'ampoulle où les calices s'embouchent. Selon au circonstance si l'ampoulle est plus développé que les calices ou au contraire si les calices sont plus développés que l'ampoulle, nous avons maintenant encore deux formes de ce type.

α) Les calices sont longs et ils se réunissent dans un ampoulle rélativement petit. Si les calices sont deux, on parle aussi d'un

bassinet avec deux branches, quand il y a trois on plusieurs calices, on l'appelle bassinet avec trois ou plusieurs branches. Le bassinet avec deux ou trois branches est la plus commun. La figure 3 montre un bassinet avec deux, figure 4 avec trois branches.

β) L'ampoulle est plus grand que chez *α*) et les calices — en nombre different — sont très courts et proportionellement à l'ampoulle très petits; c'est à la plupart des cas que les grands calices manquent du tout. A cause de cette forme grossière de l'ampoulle il arrive quelquefois une confusion entre le bassinet normal et dilaté; la distinction de l'un de l'autre n'est possible parfois que par une attention stricte des symptômes cliniques (trouble de la fonction rénale etc.). On appelle le bassinet si formé aussi bassinet ampoullaire. Figure 5.

Fig. 5. Fig. 6.

γ) Il nous reste encore à parler d'une autre forme normal du bassinet. Nous y voyons un bassinet bien formé avec des calices courts, mais auquel s'embouche à son pôle superieure encore un grand calice très long. Figure 6 montre cette forme.

Quant à la *capacité* du bassinet, on la mésure par la quantité (en centimètres cubiques) du contraste injecté. Voelcker et Lichtenberg ont trouvé 3—5 ccm pour le bassinet normal, plus tard Voelcker a déclaré que plus de 6 ccm est déja un signe d'un bassinet dilaté. Floyd E. Keen — Henry K. Pancoast ont dit que la capacité normale est entre 2—5 ccm, après Joseph elle est entre 6—8 ccm.

Pour expliquer ces differents nombres il faut se souvenir que la capacité depend de plusieurs facteurs. Ainsi nous avons une dépendance du type et de la forme du bassinet et nous voyons à cause de ce circonstance que par exemple un bassinet sans ampoulle ne contient pas une quantité si grande comme un bassinet ampoullaire. Mais aussi la méthode même à déstiner la capacité donne la possibilité à faire des erreurs. On mésure la quantité du liquid injecté jusqu'a ce moment où le malade sent des douleurs légers à la région lombaire. Ou comprend qu'il y a aussi des differences parfois assez grandes de la sensibilité de cette région et ça nous peut expliquer aussi les nombres chancelants. Et parce que nous n'examinons pas un corps mort mais un organ vivant, il faut penser aussi qu'il y a des differences fonctionelles de la grandeur aussi chez le même malade. Il est connue que par des contractions

spastiques, surtout des calices, nous recevons une mésure qui est plus petite qu'en vérité. Le contraire, qu'il y a une dilatation artificielle du bassinet à cause d'une injection d'une quantité plus grande, n'existe pas, on ne peut par cette injection que blesser le bassinet et par suite nous voyons chez ces cas le contraste dans le tissu ou sous la capsule rénale et nous ne récevons pas un radiogramme du bassinet. La quantité du liquide injecté ne nous donne pas une chiffre exacte, la mésure est toujours rélative parce que nous ne savons combien de ce liquide est entré en réalité au bassinet et nous n'avons pas aucun signe qui nous peut indiquer, combien du liquide recoule par l'uretère pendant l'injection. C'est pour ça que l'on ne peut pas fixer la capacité du bassinet par des chiffres.

On pourrait croire que la déstination de la longueur et de la largeur (en centimètres) du bassinet pyélographié nous donne des renseignements plus exacts. Mais la projection centrale nous empêche à user cette méthode et quand même nous écartons la projection à cause de la distance par un orthodiagramme du bassinet comme il est proposé par HITZENBERGER, il nous reste encore l'erreure à cause de la projection par la position du rein (position frontale — position sagittale) qui se change parfois.

Ainsi le diagnostic exacte ne doit-il pas baser à la capacité seule, mais il faut — et c'est le plus important — qu'on ait égard à la configuration du bassinet.

2) LES DILATATIONS DU BASSINET

La dilatation du bassinet n'est qu'un symptôme sous lequel plusieurs maladies se cachent. Le grand nombre de cettes maladies nous oblige à donner une classification qui permet à poser un diagnostic exact et à faciliter la thérapie. En étudiant les causes diverses qui produisent une dilatation du bassinet, on trouve deux grands groupes qui nous aident à reconnaître l'étiologie et que nous pouvons distinguer aussi au pyélogramme. L'avantage si important que nous donne cette classification dans des cas avancées, s'augmente beaucoup plus encore dans des cas au commencement. Il est connue que le diagnostic clinique y est très difficile, parce que les symptômes sont encore vagues et incertains. La pyélographie nous y sert à voir la dilatation commençante et aussi à faire un diagnostic differentiel. C'est là d'où la grande importance de la pyélographie vient comme tous les auteurs l'affirment maintenant.

A) Les dilatations causées par une rétention de l'urine

Ce groupe contient ces cas, chez lesquels l'urine rétenue dilate le bassinet à cause des anomalies congénitales du bassinet, de l'uretère et de l'artère rénale et à cause des maladies acquises qui sont accompagnées par une sténose ou par une compression de l'uretère (calcul, adhérences, ptose du rein, tumeur etc.). Cette dilatation mécanique commence toujours à l'ampoulle. Quand cette rétention de l'urine dure plus longtemps, les calices se dilatent aussi. Après un certain temps les parties du parenchyme rénal entre les calices seront pressées et cette pression provoque une atrophie des pyramides rénales parfois jusqu'à une disparition complète. En conséquance l'autre parenchyme se diminue aussi. Alors nous pouvons distinguer trois stades:

1) dilatation de l'ampoulle seule,
2) dilatation de l'ampoulle et des calices,
3) énorme dilatation de l'ampoulle et des calices avec atrophie grande du parenchyme rénale.

VOELCKER ayant vu l'importance de cette classification pour la thérapie à l'usé aussi pour la pyélographie qui nous montre distinctement les trois stades.

Le premier dégré: la dilatation de l'ampoulle seule se caractérise au pyélogramme par un agrandissement de l'ampoulle et par une augmentation de la capacité jusqu'à 20—30 ccm après VOELCKER. Les calices sont rélativement très petits et ne montrent pas aucune altération. Les contours de tout le bassinet sont tres nets avec des limits distinctes. VOELCKER a nommé ce stade *pyélectasie*. On le rencontre surtout chez les reins ptotiques avec les syndromes d'une hydronéphrosis intermittente. Figure 7 montre un pyélogramme d'un malade avec les symptômes caractéristiques de ce stade où l'autopsie opérative à confirmé le diagnostique radiologique.

Chez le deuxième stade nous voyons un pyélogramme l'ampoulle encore plus grand et les calices montrent déjà une dilatation parfois assez considerable. Quelquefois on peut reconnaître la forme originale des calices, parfois ils présentent une forme ovoide et circulaire. L'éspace entre les calices au pyélogramme est plus mince, ça veut dire que le parenchyme commence déjà à s'atrophier. Les sommets des pyramides sont plats. Ainsi le pyélogramme nous indique qu'il y a une altération du parenchyme. Les contours du bassinet sont nets. La capacité s'augmente correspondant à la dilatation de l'ampoulle et des calices. VOELCKER a nommé ce stade: *néphrectasie*. Chez le malade le pyélogramme duquel nous représentons à la figure 8 il s'agissait d'une hydronéphrose (sans infection)

du deuxième stade où la cause de la dilatation du bassinet était une insertion acutangle de l'uretère à l'ampoulle comme l'opération a montré.

Le troisième stade montre un dégré encore plus avancé. A cause de la pression perpetuelle les éspaces entre les calices se disparent, on ne voit plus les pyramides rénales. Ainsi la distinction des calices au pyélogramme est impossible et nous voyons un grand sac formé par l'ampoulle et par les calices. Les contours du bassinet

Fig. 7.

Fig. 8.

sont nets et ronds, parfois ils sont à la région du parenchyme plus ou moins onduleux. Figure 9 montre les symptômes caractéristiques de ce stade au pyélogramme.

Il est naturel qu'il existe des tableaux divers passagères et il est impossible à les nommer et à les décrire.

Le pyélogramme nous permet aussi dans tous les trois stades à voir la place de la sténose qui cause la dilatation du bassinet.

Quand la sténose se trouve au commencement de l'uretère, nous récevons un tableau, où l'uretère est très mince à la partie du rétrecissement. A la figure 10 on peut distinguer très bien la partie sténotique de l'uretère qui a causé la dilatation assez grande de l'ampoulle.

Si la sténose est plus près de l'ampoulle, la petite partie de l'uretère entre la sténose et l'ampoulle, en se dilatant, forme un sac avec l'ampoulle, où nous ne pouvous plus distinguer l'uretère même.

Quand il y a une sténose aux parties inferieures de l'uretère, nous voyons au pyélogramme la dilatation du bassinet et aussi de la partie suprasténotique de l'uretère qui est serpentiforme et fait des anses. Figure 11 montre un exemple d'une sténose inferieure de l'uretère.

Jusque maintenant nous avous parlé seulement des dilatations sans aucune infection. Il nous reste pour ça à mentionner ces cas, chez lesquels la dilatation primaire se complique avec une infection secondaire. Il est naturel que l'influence de ces deux moments sur le rein dépend du temps auquel l'infection s'ajoute à la dilatation du bassinet, et elle dépend aussi du caractère de l'infection.

On peut comprendre qu'une infection, ajoutée au troisième stade de la dilatation mécanique, ne change pas le tableau au pyélogramme; nous récevons alors le même sac grand avec des contours nets comme chez les cas sans infection.

Si l'infection se développe au deuxième stade, on peut distinguer parfois aux calices, surtout à leurs sommets, des irregularités des contours qui sont obscurs et éffacés. Figure 12 a montré le pyélogramme d'une grande dilatation mécanique du bassinet inferieur d'un rein double. L'infection secondaire à causé les irregularités des contours des calices. A cause de l'infiltration du parenchyme rénale aussi le troisième dégré de la dilatation mécanique ne pouvait plus s'établir. Figure 12 b montre le radiogramme du préparat du rein après l'opération.

Quand l'infection a amené aux développements des abscès au parenchyme rénale avec communication avec le bassinet, on peut voir au pyélogramme aussi ces cavités du parenchyme, si le contrast y est entré.

Pour le premier stade il faut noter que les altérations par l'infection secondaire sont plus manifestes; parfois elles sont accompagnées par une dilatation des calices aussi et il est très difficile, parfois impossible du tout à dire, si la dilatation ou l'infection était la première. Mais il faut mentionner que dans tous les deux stades parfois nous ne voyons pas des altérations causées par l'infection.

B) Les dilatations du bassinet causées par une infection

Tandis que nous avons vu chez le groupe premier, que la dilatation est le signe principal et caractéristique, le deuxième groupe se caractérise par la déstruction et la dilatation joue un rôle secondaire. Cette déstruction est causée par une infection, aussi infection tuberculeuse, et elle se manifeste prémièrement aux calices; l'ampoulle ne montre pas des altérations au commencement. Après un

certain temps la déstruction des calices se développe encore plus et elle est accompagnée par une dilatation des calices. Dérnièrement à cause de la rétention de l'urine une dilatation de l'ampoulle suive.

Ainsi on peut distinguer au pyélogramme trois differents tableaux ou stades:

1) *Déstruction seule des calices:* on voit que quelques calices, rarement tous les calices ont des contours irreguliers et éffacés. Il n'y a pas aucune dilatation manifeste ni des calices ni de l'ampoulle. La capacité est normale. Figure 13 montre les caracteristiques de ce stade (ce cas est déjà publié par A. SCHÖNFELD dans les «Fortschritte auf dem Gebiete der Röntgenstrahlen», tome XXIII).

2) *Déstruction et dilatation des calices*: On voit à ce stade au pyélogramme les calices avec des contours irreguliers et éffacés plus ou moins dilatés. L'ampoulle est normal. Figure 14 montre un cas pareille. On voit à la réunion des deux grands calices un calcul et à cause d'une infection la dilatation de tous les calices. Au préparat du rein après l'opération on voyait les symptômes d'une pyélonéphrite aiguë ascendante avec la dilatation des calices.

3) *Déstruction des calices avec dilatation du bassinet:* Au tableau radiographique domine la dilatation. Mais cette dilatation est differente de celle-là du groupe premier. Là elle est également étendue à toutes les côtés, elle est regulière et proportionnée. Ici la dilatation est inégale et les contours ne sont pas nets et reguliers. Ça devient de ce circonstance, que l'infection qui s'est établie aussi au parenchyme rénale ne se developpe pas dans toutes les parties également et elle laisse quelques régions du parenchyme libres. Ainsi la pression de l'urine rétenue trouve une résistance qui est petite dans les parties sans infection, tandis que l'épaissité du parenchyme infecté et infiltré empêche que la dilatation s'y étend. Pour ça la dilatation est plus manifeste chez les parties saines qui sont comprimées et atrophiées que chez les parties infiltrées où il n'y a pas une atrophie. L'infiltration du parenchyme se trouve toujours dans les parties entre les calices et pour ça cettes parties ne s'atrophient pas, les calices sont en communication avec l'ampoulle par leur canal étroit. Leurs contours sont naturellement irreguliers et éffacés. A cause de cette resistance differente du parenchyme on ne reçoit jamais un tableau, où le bassinet a une forme d'un sac comme chez le groupe premier. Figure 15 montre le tableau du troisième stade d'une pyonéphrose.

Chez ce groupe il faut mentionner les cas, où l'infection et la dilatation commencent au même temps à cause de l'insuffisance du fin vésicale de l'uretère. Ici l'urine qui si trouve à la vessie reflue à l'uretère et au bassinet pendant la contraction de la vessie.

A cause de ce reflexe de l'urine l'uretère et l'ampoulle se dilatent et l'infection ascendante dilate aussi les calices. Par consequance on voit au pyélogramme une grande dilatation de l'uretère entier serpentiforme, une dilatation de l'ampoulle et aussi des calices qui n'ont pas des contours nets et distincts chez les cas avancés. Figure 16 montre un tableau, où la dilatation de l'uretère et du bassinet était causée par une insuffisance de l'uretère chez une vessie tuberculeuse.

3) TECHNIQUE DE LA PYÉLOGRAPHIE

Il sera inutile de citer encore une fois l'importance d'une bonne technique pour la pyélographie et pour le diagnostic; ça est tout connue. Pour réussir il faut la maîtriser. En supposant la connaissance de la technique en général, nous voulons donner ici seulement quelques renseignements des petits détails usés à notre institut.

Nous croyons qu'il est indispensable pour le succès que le malade aussi soit préparé; pour éviter un météorisme qui trouble le tableau nous prenons soins que l'intestin soit nettoyé par un lavement bref temps avant la photographie.

Nous ne commençons pas ordinairement avec la radiotechnique avant que l'assistant qui a introduit le sonde à l'uretère nous assure que le bassinet ne contient plus de l'urine et nous ne quitterons cette règle que chez les cas où le sonde ne peut arriver au bassinet à cause d'une sténose. Par cette manière nous sommes sûres que la quantité du contraste injecté remplit le bassinet et ne se mêle pas avec l'urine retenue; le contraste tiendra son épaissité et la quantité injecté du contraste correspond rélativement à la capacité du bassinet. Figure 17 montre un pyélogramme, où le bassinet était rempli avec de l'urine, le contraste se mêlait avec celle-là et à la photographie on voit à peine la grande dilatation du bassinet; quand on n'est pas attentif, on ne distingue pas le bassinet, peut-être un diagnostic faux résulte.

L'injection même du contraste doit être effectué lentement avec précaution minutieuse pour ne pas causer une blessure du bassinet; la pression sous laquelle l'introduction du liquid se fait ne soit pas grande et quand on sent résistance, il est préférable à cesser avec l'injection.

Au moment où le malade commence à sentir un douleur leger à la région lombaire, la photographie rapide se fait pendant l'apnée du malade avec compression de l'abdomen pas forte sans que la pression du liquide injecté se diminue.

Souvent nous répétons la photographie à la position assise du malade pour voir mieux une sténose de l'uretère ou une ptose du rein.

Avant chaque pyélogramme nous faisons toujours une photographie ordinaire (sans injection) du rein et de l'uretère de la même côté qui nous renseigne parfois des points remarquables et importants (calcule, etc.)

Après la photographie nous laissons le sonde au bassinet et nous controlons l'écoulement du liquid injecté.

Pour l'injection nous usons une solution de 20 % de bromure de natrium, bien sterilisée, ce qui n'est pas du tout dangereux après nos experiences et donne un bon contraste.

RÉSUMÉ

1) Pour être exact à la nomination des parties diverses du bassinet nous proposons le mot «ampoulle» pour le si nommé bassinet anatomique; le mot «calice» reste et nous usons «bassinet» pour le calices et l'ampoulle ensemble.

2) Classification du bassinet normal dans le type sans ampoulle et avec l'ampoulle. Enumération et déscription des trois formes du type dernier.

3) Expliquation et critique de la mésure de la capacité du bassinet.

4) Division en deux groupes des dilatations du bassinet à cause de la pathogénie, visible au pyélogramme: dilatations causées par une rétention de l'urine et dilatation causées par une infection du bassinet.

5) Chez le groupe premier nous distinguons trois stades: a) dilatation de l'ampoulle seule; b) dilatation de l'ampoulle et des calices; c) énorme dilatation du bassinet avec une grande atrophie du parenchyme rénale. Description de ces stades, comment ils se réprésentent au pyélogramme. Influence d'une infection secondaire sur ces tableaux.

6) Division du deuxième groupe en trois stades: a) déstruction seule des calices, b) déstruction et dilatation des calices, c) déstruction des calices avec dilatation du bassinet. Déscription des tableaux correspondants.

7) Déscription de quelques points nécessaires pour la technique de la pyélographie.

SUMMARY

1) In order to give an exacte nomenclature of the different parts of the renal cavities we propose: «ampulle» for the so-called anatomical pelvis of the kidney and »pelvis» for both the ampulle and the calices; calice rests.

2) Classification of the normal pelvis in a type without ampulle and in such one with ampulle. Enumeration and description of the 3 forms of the latter type.

3) Explication and criticisme of the mesure of the capacity of the pelvis.

4) Division into two groups of the dilatation of the pelvis by reason of the pathogenesis visible in pyelogram: dilatation caused by retention of urine and dilatation caused by infection of the pelvis.

5) In the first group we distinguish 3 periods: a) dilatation of the ampulle b) dilatation of the ampulle and of the calices c) enormous dilatation of the pelvis with great atrophy of the renal tissue. Description of these periods how they are represented in pyelogram. Influence of a secondary infection.

6) Division of the secoud group in 3 periods: a) destruction alone of the calices b) destruction and dilatation of the calices c) destruction of the calices with dilatation of the pelvis. Description of correspondent pictures.

7) Discription of some necessary points for the technic of the pyelography.

ZUSAMMENFASSUNG

1) Um eine deutliche Nomenklatur der verschiedenen Abschnitte der Nierenhohlräume zu geben, schlagen wir vor «Ampulle» für das sog. anatomische Nierenbecken und «Becken» zur Bezeichnung der Ampulle und Kelche zusammen; «Kelch» wird beibehalten.

2) Einteilung des normalen Beckens in einen Typ ohne Ampulle und mit Ampulle. Aufzählung und Beschreibung der drei Formen des letzteren Typus.

3) Erklärung und Kritik der Kapazitätsbestimmung des Nierenbecken.

4) Scheidung in zwei Gruppen der Nierenbeckenerweiterungen auf Grund der Pathogenese, kenntlich am Pyelogramme: Erweiterungen infolge Harnverhaltung und Erweiterungen infolge Beckeninfektion.

5) Bei der ersten Gruppe unterscheiden wir 3 Stadien: a) Erweiterung der Ampulle allein; b) Erweiterung der Ampulle und der Kelche; c) Hochgradige Erweiterung des Beckens mit grosser Atrophie des Nierenparenchymes. Beschreibung dieser Stadien, wie sie sich im Pyelogramme zeigen. Einfluss einer sekundären Infektion auf diese Bilder.

6) Einteilung der 2. Gruppe in drei Stadien: a) alleinige Zerstörung der Kelche; b) Zerstörung und Erweiterung der Kelche; c) Zerstörung der Kelche mit Erweiterung des Beckens. Beschreibung entsprechender Bilder.

7) Beschreibung einiger notwendiger Punkte für die Technik der Pyelographie.

RESUMEN

1) Para ser exacto en la denominación de las distintas partes de la pelvis proponemos la palabra «ampolla» para la pelvis anatómica; la palabra «cáliz» se conserva y utilizaremos «pelvis» para los cálices y las ampollas en conjunto.

2) Clasificatión de la pelvis normal en el tipo con ampolla y sin ampolla. Enumeración y descripción de tres formas del último tipo.

3) Explicación y crítica de la medida de la capacidad de la pelvis.

4) División en dos grupos de las dilataciones de la pelvis a causa de la patogenia, visible al pyelogramo: dilataciones causadas por una retención de la orina y dilatación ocasionada por una infección de la pelvis.

5) En el primer grupo distinguimos tres estados: a) dilatación de la ampolla sola; b) dilatación de la ampolla y de los cálices; c) enorme dilatación de la pelvis con gran atrofia del parenchyme renal. Descripción de los gra-

bados, y de la manera como aparecen al pyelogramo. Influencia de una infección secundaria en estos casos.

6) División del segundo grupo en tres estados: a) destrucción sólamente de los cálices; b) destrucción y dilatación de los cálices; c) destrucción de los cálices y dilatación de la pelvis. Descripción de los grabados correspondientes.

7) Descripción de algunos puntos necesarios para la técnica de la pyelografia.

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Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12 a.

Fig. 12 b.

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

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FROM THE ROENTGEN DEPARTMENT OF THE MILITARY HOSPITAL OF STOCKHOLM

THE ROENTGEN PICTURE OF FRESH SUBPERIOSTEAL HEMORRHAGE IN FRACTURES OF THE METATARSALS

by

Gösta Runström

(Tabula III)

The Roentgen picture of the injuries of the metatarsus which occur most often in military drill, and which are called "Fussgeschwulst" etc., have been described by several authors. In a great number of these cases fractures can be found, surrounded by spindle-shaped deposits which are generally interpreted as callus. In some cases it has not been possible to prove any fracture, but many authors consider these deposits to be a callus formation round an invisible fracture. Some authors deny the existence of a fracture in these cases and consider that the deposit is the product of a traumatic periostitis produced by stasis and hemorrhages in the periosteum owing to this being stretched by overstraining. Some authors consider further that fractures may occur, secondary to the periostitis, owing to disorders of nutrition in the metatarsal bones, attended with a decreased elasticity of these bones.

One author is of the opinion that such deposits are caused by a periostitis after a hematogenic infection.

The most common view at present is no doubt that these deposits consist of a callus formation round a metatarsal fracture, but this implies, however, that such a long time must have elapsed from the time of the injury to the finding of the deposit that a callus formation may be possible. There is, however, one fact which, as far as I have been able to find, has been overlooked, viz. that in cases of metatarsal injuries both after marching and after definite traumata one finds very often thin spindle-shaped deposits *already in the next few days after the trauma.* In these cases there can obviously be no question of a callus or an ossifying periostitis, as a period of at least two or three weeks is necessary before they appear. The explana-

tion of these fresh deposits will no doubt be made clear by the following cases.

My material at the Military Hospital comprises partly injuries after definite traumata — direct or indirect — and partly "marching injuries" without known trauma. The cases belonging to the first category may, of course, be determined as to time. In the second group, I have included only such cases where it has been possible to determine the maximum time elapsed after the occurrence of the injury by the patient being able to state exactly the time of the first appearance of the symptoms during a march, e. g. after a false step, and by the fact that prior to this he has had no symptoms whatever. Besides, many of these cases have got their symptoms after only a short period of drilling.

I have divided the material into three groups according to the roentgenologic findings.

Group I. 14 cases show a *fracture* or a fine *fissure without dislocation*, and a *thin spindle-shaped deposit*. 2 of these cases have occurred after a definite trauma and have been examined by roentgen on the 4th and 6th day. Of the remaining cases 8 have been examined on the 2nd to the 4th day and the rest on the 6th to the 8th day after the trauma.

Group II. 12 cases show a *thin spindle-shaped deposit* but *no absolutely provable fracture*. 3 of them have occurred after a definite trauma and have been examined on the 1st, 5th and 7th day. Of the marching injuries 6 have been examined on the 3rd to the 6th day and the other ones on the 7th to the 8th day.

Group III. 19 cases show fractures with *distinct dislocation* but *no spindle-shaped deposit*. 6 of these have occurred after a definite trauma and have been examined on the 1st to the 5th day. Of the "marching injuries", 12 have been examined on the 1st to the 5th day, and 1 on the 8th day.

If one considers the 1st and 2nd groups with regard to the time elapsed between the injury and the finding of the deposit, it is obvious that these deposits can not have been produced by a callus formation or by an ossifying periostitis.

If one compares the 1st and the 2nd groups with the 3rd, one will find the remarkable fact that these spindle-shaped deposits are *not* produced when fractures *with dislocation* are present, and that, on the other hand, there is *no dislocation* when these deposits are *present*.

In group II, where no fissures are visible in the roentgenogram, there is very likely a fissure in the bone. This is due to the fact that these fissures are so fine that they come into view only in the

most favourable projection, and the surrounding shadow helps to conceal them further.

Thus, it is a characteristic of these deposits that they can be demonstrated already a few days after the occurrence of the trauma, and that they do not appear in fractures with dislocation. I have therefore assumed the reason for these thin spindle-shaped deposits to be a subperiosteal haematoma in association with a subperiosteal fracture. As the blood collects underneath an intact periosteum, the haematoma becomes so dense and circumscribed as to be visible in the roentgenogram. In fractures with dislocation, when te periosteum must be said to be ruptured, the blood spreads out and a circumscribed haematoma is not produced.

SUMMARY. Thin spindle-shaped deposits may be found in meta-tarsal fractures already in the first few days after the trauma. These deposits do not occur in fractures with dislocation. The author is of the opinion that these deposits are caused by subperiosteal haematomata in subperiosteal fractures. Owing to the haematoma collecting underneath an intact periosteum, it becomes so dense and circumscribed as to become visible in the roentgenogram.

ZUSAMMENFASSUNG. Bei Metatarsalfrakturen sind häufig schon wenige Tage nach dem Trauma dünne spindelförmige Ablagerungen zu finden. Bei Frakturen mit Dislokation kommen sie nicht vor. Der Autor ist der Ansicht, dass diese Ablagerungen durch subperiostale Hämatome bei subperiostalen Frakturen bedingt sind. Dadurch das sich das Hämatom unter einem intakten Periost ansammelt, gestaltet es sich so dicht und zirkumskript, dass es im Röntgenogramme sichtbar wird.

RÉSUMÉ. On peut trouver de fins dépôts en forme de fuseau dans les fractures du métatarse déjà les premiers jours après le trauma. Ces dépôts ne se forment pas quand il s'agit de fractures avec dislocation. L'auteur croit que ces dépôts sont causés par des hématomes sous-périostiques dans des fractures sous-périostiques. Comme l'hématome se collectionnent sous un périoste intact il devient si dense et à contours si nets qu'il est visible dans une image radiographique.

RESUMEN. En las fracturas del metatarso puede encontrarse, y a en los primeros días después del trauma, depósitos finos en forma de huso. Estos depósitos no se forman cuando se trata de fracturas con dislocación. El autor cree que estos depósitos son ocasionados por hematomas sub-periósticas en las fracturas sub-periósticas. Como la hematoma se acumula bajo un periosto intacto resulta tan denso y de contornos tan limpios que resulta visible en una imagen radiográfica.

Fig. 1. Roentgenogram taken on the third day. Fissure with lipshaped raised cortex. No deposit.

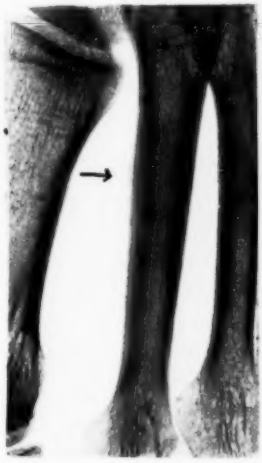

Fig. 2. Roentgenogram taken 1 day after trauma. Fine fissure, deposit.

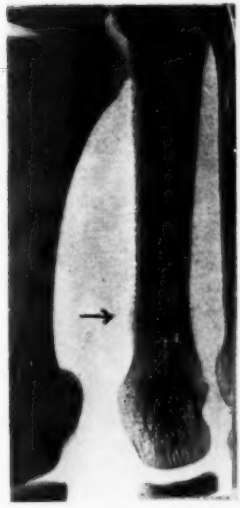

Fig. 3. Roentgenogram taken 4 days after trauma. Fine fissure and deposit.

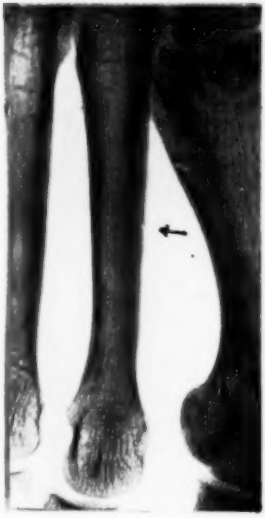

Fig. 4. Roentgenogram taken 4 days after marching injury. Fissure and deposit.

Fig. 5. Roentgenogram taken 4 days after marching injury. Thin deposit.

Fig. 6. Roentgenogram taken 6 days after marching injury. Fine fissure and deposit.

FROM THE ROENTGEN DEPARTMENT OF THE SABBATSBERG HOSPITAL.
HEAD PHYSICIAN: DR. M. SIMON

ON FRACTURES OF THE PROXIMAL PORTION OF THE RADIUS AND THEIR CAUSES

by

Dr. G. Odelberg-Johnson

(Tabulæ IV—VI.)

Fractures of the head and neck of the radius are fairly frequent occurrences. In the Roentgen Department of Sabbatsberg Hospital 43 cases have been roentgenographed during the period Jan. 1 1920 — June 1 1922. The total number of cases diagnosed as fractures of the upper extremities were about 1 500. The fractures of the proximal portion of the radius were, thus, nearly 3 per cent of all arm fractures.

As a rule, it is difficult to obtain reliable information as to how an accident has happened. Reliable information as to the origin of the lesion is also to a large extent lacking in my material. Nearly all the cases have been attended to in the Out-patient Department of the Hospital, and the clinical data have generally been limited to what has been stated on the remittance card. Out of the 43 patients 16 were males and 27 females, 37 adults and 6 children. In 16 cases the cause of the injury was stated to be a blow on the bent elbow, in 4 cases, a blow on the hand, when the elbow-joint was extented. In 3 cases the injury had been produced in conjunction with backward luxation of the forearm. In the remaining cases there was no information as to how the injury had happened. — Two roentgenograms have been taken in each case, one in a ventro-dorsal projection, and one in radio-ulnar projection.

Fractures of the proximal portion of the radius occur as a rule owing to a blow in the longitudinal direction of the radius. Transverse fractures of the neck, do, however, occur through some other cause, sometimes by direct violence. They are frequently associated with fractures of neighbouring bones.

The fractures produced by a blow in the longitudinal direction of the radius are by far the most common. They occur, according to LESSER, by a blow against the hand when the upper arm is fixed, e. g. in falling upon one's face upon the stretched arm. In some experiments that he made on corpses, a fracture of the radial head was produced by a blow on the distal end of the radius, with the elbow-joint flexed at an angle of 90° and the forearm pronated. A condylar fracture of the humerus was produced in another experiment, and a fracture of the olecranon occurred with the arm in supination. LESSER regards a separation of the anterior internal portion of the radial head as typical. A simultaneous fracture of the coronoid process of the ulna is said to occur especially in injuries with the arm bent.

P. BRUNS describes the typical fracture of the head of the radius as an oblique or longitudinal, intra-articular fracture, separating a segment of the anterior circumference of the head. The fracture may also be T-shaped. A complication, with fracture of the ulnar coronoid process, is said to be a common occurrence. A fall upon the hand with the elbow-joint stretched or on the bent elbow is, according to him, the cause of the fracture of the radius. The fracture is said to occur, when «Eminentia capitata durch gewaltsamen Anprall gegen den Rand der tellerförmigen Grube des Radiusköpfchens letztere abdrückt». The fracture is more common with the elbow-joint streched, as the head of the radius would then extend farther behind the capitellum of the humerus than it does in flexion, because the articular surfaces cover each other better in that position. Fractures of the radial head will further, according to him, occur in «Fall auf den Daumenballen», whereas a blow on the ulnar side of the hand will produce a fracture of the coronoid process of the ulna. Fractures of the radial head are sometimes said to occur in conjunction with luxation of the elbow-joint.

MOUQUET publishes eleven fractures of the radial neck in children. He describes partly transverse and partly oblique fractures. The cause of the injury is, according to him, partly a fall upon the stretched forearm, and partly a blow on the bent elbow-joint. — STOECKLIN distinguishes between fissures and fractures. Among the latter ones he distinguishes between «chisel fractures», radiating fractures, sprain fractures and subperiosteal fractures. As to the cause of the injury he has the same view as BRUNS. He points out that the separation in «chisel fractures» takes place in the anterior or anterior external portion. In children, he describes fractures of the radial neck without injury of the head. — DAUGHERTY supposes, that the depression of the edge of the radial head occurs in an «attempt at

a posterior dislocation», but he does not state the reasons for this supposition.

HITZROT publishes 161 fractures of the radial head and neck. Ten of these are «extra-articular transverse fractures» of the neck, produced by strong violence. The remaining ones are «chisel fractures» and comminuted fractures. The injury in 26 cases had occurred in conjunction with backward luxation of the forearm. Ten of the cases were children, and he describes the injury in these cases as a separation of the epiphysis. His roentgenograms show, however, only a partial separation of the epiphysis in combination with fracture of the radial neck. The injury in the majority of his patients had been caused by a fall upon the hand with the forearm stretched, which he considers the most common mode of origin. However, he also quotes STIMSON's view that the fracture is produced by a forced abduction of the forearm.

Starting with the arm in supination, the upper end of the radius has the following appearance. Anteriorly, about 4 c. m. below the elbow-joint, we have the bicipital tuberosity of the radius, the insertion of the biceps tendon. Above this tuberosity, the shaft of the radius gets narrower and forms the neck of the radius which supports the radial head. On the anterior and internal side the neck merges direct into the circular articular surface of the head, circumferentia articularis, which is here fairly broad. The posterior and external surfaces of the neck pass in a concave arch into the circumference of the head which on this side is thinner. Here, the head is, thus, jutting out over the neck. From this follows that the posterior portion of the head, when exposed to a blow in the longitudinal direction of the radius, is weaker than the anterior portion which is directly supported by the bony mass of the neck. The shape and size of the head vary greatly. The head of the radius can be rotated about 180° between extreme supination and extreme pronation. The articular fossa of the radius, its proximal articular surface, is hollowed out like a cup, forming about 70° of a sphere. The corresponding articular surface of the humerus, the capitellum, is also spherically shaped. (RAUBER-KOPSCH.) It is placed centrally in the articular fossa of the radial head, and the two articular surfaces coincide well in flexion as well as in extension, which fact is also apparent from the roentgenograms. The tuberosity of the radius is directed straight backward in extreme pronation, and the posterior weak portion of the head is consequently directed forward.

The writer has made some experiments with elbow-joints, from which, by way of clearness, the soft parts have been removed. Only the collateral ligaments and the annular ligament of the radius have been

preserved. The articular surfaces could only be slightly displaced forward and backward in their relation to each other by powerful traction of the ligaments. When the humerus was fixed, a heavy blow on the distal end of the radius produced a fracture of the head, *only in pronation and simultaneous subluxation backwards of the forearm as far as the ligaments allowed.* The convexity of the capitellum came in this way to rest against a point in front of the centrum of the cup-like articulation of the radius, corresponding to the weakest portion of the radial head which is directed forward in pronation. Typical «chisel fractures» were produced by this means, both with the elbow stretched, and in flexion of 90 degrees, as well as in some intermediate positions. The «chisel fractures» are therefore not produced by any wedging effect but by a depression of the portion of the radial head that is situated most anteriorly in pronation. — But, on the other hand, I did not succeed even by strong violence in producing a fracture when the joint surfaces were in their normal relations. Nor did fracture occur in supination. When the blow hit both the radius and the ulna there was at the same time a fracture of the coronoid process.

In falls upon the hand, the elbow-joint being entirely or partly stretched, the head of the radius is forced against the articular surface of the humerus. In «falls upon the bent elbow», i. e. a blow on the olecranon and the posterior surface of the humerus, the head of the radius will very likely, by a contre-coup effect, be forced against the articular surface of the humerus so strongly as to cause a fracture. In falls upon a stretched forearm, the hand is pronated, more or less voluntarily. (It is a well-known fact that a supinated arm does not afford any substantial support.) In falls upon a stretched forearm as well as in the case of blows on a bent elbow, a posterior subluxation of the radial head is probably a necessary condition for the occurrence of the fracture. Experiments on corpses can never be compared with an injury to a living individual, as the muscular effect is entirely eliminated, but as far as the occurrence of the actual fracture is concerned, one is no doubt justified in drawing certain conclusions even from such an experiment.

That Lesser, Bruns and Stoecklin fix the separation at the anterior portion of the head of the radius is probably due to the fact that they take the pronation for granted. This is evident at least from Stoecklin's pictures. — Brun's theory, quoted also by Turner, that the head of the radius in extension reaches farther behind the capitellum than it does in flexion, has of course no foundation whatever. Stimson's theory that a fracture of the radial head might be caused by a forced abduction of the forearm, is evidently false. The

radial head reaches laterally somewhat beyond the capitellum, and for a depression of the posterior border of the head to take place, this must be directed medially, corresponding to the capitellum. As the posterior portion of the head of the radius can never be directed medially, his theory collapses by its own impossibility.

My material comprises 43 cases of fractures of the head or neck of the radius. Six of these are complicated by fracture of the coronoid process of the ulna, two, by fracture of the internal epicondyle, and one, by fracture of the external epicondyle.

The first group comprises 27 cases of pure vertical fracture of the radial head, so-called «chisel fractures». Here one meets partly with fissures through the head, extending in some cases down into the neck, and partly with fractures with separation of a large or small portion of the head, there being in some cases only a slight separation from the rim of the head. The line of fracture runs as a rule in an internal external direction or internal-posterior external-anterior direction, so that the posterior or posterior external portion of the head is separated from its connection. In 7 cases there is only a fissure, and in 16 cases there is a fracture with a distinct diastasis or gap between the fragment. Fig. 1 shows a typical picture, separation of the posterior portion of the head, about 3 m. m. diastasis between the fragments, the separated piece being somewhat displaced downward. Figs. 2 and 3 show a case with a small piece separated from the posterior edge of the head, and also separation and dislocation of a large fragment from the posterior external portion of the head, with a coincident fracture of the coronoid process of the ulna. Four cases show only a fracture of the head. Fig. 4 shows one of these cases, with distinct distal dislocation of the fragment. Fig. 5 shows a fragment 2 c. m. in length separated from the posterior external portion of the edge. Fig. 6 shows a different picture, with a large separation from the external half of the head, and a line of fracture running chiefly from before backward.

All these cases exhibited fairly slight symptoms, pressure tenderness over the radial head and a somewhat reduced motion of the elbow-joint, especially reduced supination, and pain in extreme movements.

In all cases the injury may be explained by a blow in the longitudinal direction of the pronated radius, when this is at the same time slightly subluxated backward. (The weakest portion of the articular fossa of the radial head, which is directed forward in pronation, receives the blow against the capitellum.)

The varying position and direction of the fracture line is probably

due to the arm being in a more or less extreme pronation at the occurrence of the accident. In the case shown in Fig. 6 the fracture seems to have occurred in mid-position between pronation and supination, when the external aspect of the radial head is directed forward.

The second group comprises «chisel fractures» in conjunction with transverse fractures of the neck of the radius (8 cases). The chisel fracture extends here down through the radial neck and branches in the shape of a T, so that the fragments of the head become completely detached from the neck. In four cases there is only a fissure through the neck, in four other cases the fragments of the head exhibit a wider displacement. These fractures do probably occur in the same way as the chisel fractures. Figs. 7 and 8.

The third group includes six cases of true fracture of the radial neck without injury to the head. All of these cases are children with open epiphyseal line between the epiphysis of the head and the diaphysis of the radius. In four cases one sees here a *depression* of the posterior external region of the neck, appearing in two of the cases as a sharp angular bend in the bone cortex (Fig. 9). Fig. 10 shows a distinct transverse fissure, but also longitudinal fissures do occur. The epiphysis in the above-mentioned cases was uninjured, and I have not found in the literature any statements with regard to lesions of the epiphysis of the radial head in children.

Since one meets with the greatest depression of the posterior external aspect of the radial head and neck also in this third group, one may easily suppose that these fractures also occur by pressure on that edge of the radial head that is directed forward in pronation. But thanks to the elasticity of the epiphyseal cartilage, the epiphysis escapes every visible lesion. The epiphysis is instead forced against the radial neck, causing thus a depression of the posterior external aspect of the diaphysis. In my material I have got no typical epiphyseal separations resembling those described by HITZROT. (HITZROT's figures show, however, only a partial separation of the epiphysis in conjunction with fracture.)

Of quite a different type are two cases that chiefly coincide with the transverse fractures of the radial neck which HITZROT describes as extracapsular. In these two cases of adults there are transverse fractures of the radial neck without lesion of the head, in both cases in combination with transverse fractures of the ulna, just distal to the radial fracture. In one of these cases the radial head is displaced proximally, its periphery being directed toward the neck fragment (Fig. 11). The other case shows a slight forward displacement of the head and also a fracture of the coronoid process of the ulna.

Unfortunately there are no informations to hand as to the cause of the fracture in these cases.

The fact that one and the same kind of trauma produces fractures of the radial neck in children and vertical fractures of the radial head in adults is probably due to the different structure and strenght of the bone before and after the closing of the epiphyseal line. The small variations in the pictures are very likely due to the arm being held in a more or less pronounced pronation at the time of the accident, and to the violence being of unequal strength, but perhaps chiefly to different degrees of posterior subluxation of the forearm.

BRUN's above cited explanation of the cause of the «chisel fractures» refers no doubt to all three groups of fractures, but this course of events, with depression by the capitellum of the edge of the radial head that is directed forward in pronation, is inconceivable without a certain posterior displacement of the radial head in relation to the humerus.

Many different lesions, such as fracture of the clavicle, luxation of the scapula, humeral fractures with various localization, luxation of the elbow-joint, radial fractures with various localization, fractures of the forearm, etc., may occur by a blow in the longitudinal direction of the arm, for instance in falling forward upon the extended arm. The localization of the lesion in each separate case depends upon unknown factors. Fractures of the proximal end of the radius, especially vertical fractures of the radial head, seem to be common occurrences, even though they are often overlooked owing to their slight clinical symptoms.

SUMMARY

The material of the writer comprises 2 cases of extra-capsular transverse fracture of the neck of the radius (Hitzrot), 35 cases of «chisel fractures» of the head of the radius, either with or without a T-shaped fracture of the neck, and also 6 cases of a simple fracture of the neck of the radius in persons with an open epiphyseal line.

Concerning the manner in which the «chisel fractures» and the fractures of the radial neck in children are produced the writer agrees with the wiews of P. BRUNS and others. According to him, such fractures are produced by a blow in the longitudinal direction of the radius in pronation, the capitellum pressing down the anteriorly directed rim of the articular fossa of the radius.

The writer, however, shows that this course of events is inconceivable without a posterior subluxation of the radial head taking place simultaneously. And the experiments of the writer on elbow-joints of corpses do also favour this view.

ZUSAMMENFASSUNG

Das Material des Verf. besteht aus 2 Fällen von extrakapsulärer Querfraktur des Radiushalses (Hitzrot), 35 Fällen von «Meisselfrakturen» des Radiuskopfes mit oder ohne eine T-förmige Fraktur des Halses und auch 6 Fälle von einfacher Fraktur des Radiushalses bei Individuen mit offener Epiphysenlinie.

Betreffs der Art, in welcher die «Meissel-Frakturen» und die Frakturen des Radiushalses bei Kindern zustandekommen, stimmt der Verf. mit den Ansichten von P. Bruns u. a. überein. Nach seiner Meinung werden solche Frakturen durch Einwirkung der Gewalt in der longitudinalen Richtung des Radius in Pronation hervorgerufen, indem das Capitellum auf den nach vorne gerichteten Rand der napfförmigen Gelenkfläche des Radius nach unten presst.

Der Verf. zeigt indes, dass dieser Gang der Dinge unverständlich wäre, ohne dass gleichzeitig eine Subluxatio posterior des Radiuskopfs stattfindet. Und die Experimente, die er an Ellbogengelenken von Leichen gemacht hat, sprechen gleichfalls für diese Auffassung.

RÉSUMÉ

Le matériel dont l'ateur dispose comprend 2 cas de fracture transversale extra-capsulaire du cou du radius (Hitzrot), 35 cas de fracture «de ciseau» de la tête du radius, avec ou sans fracture en forme de T du cou, ainsi que 6 cas d'une simple fracture du cou du radius chez des personnes avec une ligne épiphyséale non fermée.

Quant aux circonstances qui causent des fractures «de ciseau» et des fractures du cou du radius chez des enfants, l'auteur a les mêmes idées que P. Bruns et d'autres. D'après lui ces fractures-là sont occasionnées par un coup porté en direction longitudinale sur le radius en pronation, le capitellum pressant sur le bord antérieur de la fosse articulaire du radius.

L'auteur pourtant montre que cette suite de faits est inconcevable sans une subluxation postérieure simultanée de la tête du radius. Aussi les expériences de l'auteur faites à des articulations de bras de cadavres favorisent cette explication.

RESUMEN

El material del cual dispone el autor se refiere a 2 casos de fractura transversal extra-capsular del cuello del radius (Hitzrot), 35 casos de fractura a «tijera» de la cabeza del radius, con o sin fractura en forma de T del cuello, así como de 6 casos de fractura simple del cuello del radius, en personas con la línea epifiseal sin cerrar.

Con referencia a las circunstancias que originan las fracturas a «tijera» y las fracturas del cuello del radius en los niños, el autor tiene la mismo opinión que P. Bruns y otros. Según su opinión estas fracturas son ocasio-

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

nadas por un golpe recibido en el radius en dirección longitudinal, en pronación, haciendo presión el capitellum sobre el borde anterior de la fosa articular del radius.

Por lo tanto, el autor indica que esta serie de hechos resulta inconcebible sin una subluxación posterior simultánea de la cabeza del radius. Igualmente las experiencias llevadas a cabo por el autor en las articulaciones de brazos de cadáveres atestiguan esta explicación.

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A CASE OF MYOSITIS OSSIFICANS

by

Axel Westman

(Tabula VII.)

In the summer 1922 a case of myositis ossificans was received at the County Hospital in Karlstad. On account of the rareness of this disease and the considerable extension of the process this case might well be worth being reported on.

Its *clinical history* is shortly as follows:

Boy, Å. A. aged 2½ years. Was admitted on Aug. 4th 1922 to the Medical Dep. His parents and four elder brothers and sisters in good health. A similar disease is not known to have occurred in the family. Born at full term and in good health. Had the measles at the age of 7 months. No trauma known to have occurred. Has been enjoying good health till about a year ago, when a tumour the size of an apple appeared, without any known cause, on the right side of his neck. Its consistence was soft. The skin overlying the tumour was unchanged. No tenderness. No general symptoms. No increase in the temperature. His back is said to have been somewhat swollen at the same time. At the end of about two months the tumour disappeared quite spontaneously, the arms of the patient beginning at the same time to grow stiff. His right arm became gradually fixed in adduction, with flexion of the elbow-joint, his left arm becoming fixed in the same position after a little while. His neck, too, was stiff. He has not complained of any pains. The arms had grown less stiff for the past months. Apart from his stiffness, he has been quite well, has enjoyed a good appetite and has been developing in a normal manner.

Status praesens: General development normal. In a good state of nutrition. The skin is pale in colour, and does not exhibit any changes whatever. Wassermann reaction negative. Nothing abnormal about his lungs and heart. Pharynx: O. Abdomen without remark. No enlargement of the spleen. Nothing abnormal can be palpated on the skull. Muscles of mastication and the mimic muscles show no changes. Some swellings the size of hazel-nuts and as hard as bone are palpated in the short muscles of the neck. Three hard pea-sized lumps are felt fixed in the right sternocleidomastoideus, and several similar swellings are felt in the left sternocleidomastoideus. The patient holds his neck a little stiff, but passively it can be moved freely. On the anterior internal side of the left upper arm underneath the biceps a hard and uneven swelling the thickness of a pencil is palpated, which can be traced from the upper third of the humerus, running parallel with this and reaching down to the region of the elbow-joint, where it increases to a

nut-sized tumour. Upward as well as downward some cords of softer consistence can be felt extending from either end of the swelling, upward to the scapula and downward to the upper region of the radius. The scapulohumeral joint is completely anchylosed. The arm is fixed in adduction. Very limited mobility of the elbow-joint which can be stretched passively to 130 degrees and bent to 90 degrees. A similar swelling is palpated in the right upper arm. On this side, too, there is anchylosis of the shoulder-joint and a restricted mobility of the elbow-joint, which can be bent and stretched passively between 130 and 170 degrees. In the left posterior region of the thorax there is an uneven swelling as hard as bone and stretching from the region of the angle of the scapula downward for 7 centimeters, and measuring 4 centimeters from side to side, its lower extremity running out into a sharp point which projects a great deal above the surface. The swelling is firmly adherent to the underlying tissues. In the right axillary line on a level with the 8th and 9th ribs a couple of pea-sized lumps are felt which are movable against the underlying tissues. No other swellings are to be felt.

Roentgenograms show the following details. In the left upper arm (cf. Fig. 1. Tab. VII): In the soft parts on the internal side of the upper arm there is a distinctly calcified formation 8 centimeters in length, the distal end of which for a distance of three centimeters has a breadth of one centimeter, whereas the rest of the formation measures only four millimeters in breadth. At the proximal end of this extended calcification there is a thin calcified formation about one centimeter in length, which is placed transversely to and connected with the larger one. In the soft parts of the lateral wall of the thorax one can see similar calcifications, extending downward from the axilla in a tortuous course and measuring about three millimeters in diameter. The right upper arm (cf. Fig. 2). In the soft parts on the internal side of this arm, too, there is a calcification of similar appearance as the one in the left upper arm. Also in the lateral thoracic wall just below the axilla one finds a calcification two centimeters in lenght and 2 millimeters in breadth. There is nothing abnormal about the hand and foot skeletons.

Roentgendiagnosis: Myositis ossificans (Dr. Larsén).

The patient was transferred to the Surgical Department where a specimen was removed from the right upper arm on August 7th (Dr. Hansson). The swelling which had been palpated in this locality, and which was running parallel to the humerus, was found to consist of a bar of bone lying in the medial intermuscular septum and well isolated from the surrounding tissues. Neither the surrounding fascia nor the adjacent musculature exhibited any macroscopically visible changes. The specimen cut out from the calcification was found to consist histologically of bone tissue provided with lacunae, each of which contained only one bone cell. Larger cavities were seen here and there, containing connective tissue poor

in cells. Cells were only sparingly met with on the border to both the surrounding connective tissue and the tissue present in these cavities, and there were no signs of either osteoblastic or osteoclastic activity. Lamellae were entirely lacking. Cartilaginous tissue was nowhere to be found. The surrounding connective tissue was fibrous and poor in cells. No signs of inflammation were to be seen. The adjacent muscles were of normal structure, and did not exhibit any signs of inflammation.

We find, thus, that the present case corresponds well in its main characteristics with the clinical picture that has been named myositis ossificans, the pathogenesis and etiology of which have been the subject for a keen interest, ever since it was described in detail by MÜNCHMEYER in the sixties. Its clinical picture is well known and will only be touched upon very briefly in this connection. The disease does usually commence during the first ten years of life, frequently with rheumatic pains in the muscles of the neck and shoulders. With or without any symptoms in the form of an increase in temperature, swellings form in muscles, tendons and their attachments, being sometimes painful and sometimes not. After having persisted for a longer or shorter period, these swellings subside, leaving frequently some hard new-formations of bone. The skin overlying these swellings is not unfrequently red during the acute stage. Generally the disease spreads symmetrically and progresses with intermissions. Usually death ensues through inanition or phthisis, owing to the lungs being badly ventilated after the mobility of the chest has been extinguished as a result of the process of ossification.

The opinions have varied with regard to the pathogenesis of the disease. The name myositis ossificans signifies that the process of ossification has originally been considered to have occurred in connection with inflammatory changes in the muscles, but it has been proved by several recent investigations that the primary changes are to be found in the connective tissue, and then above all in the connective tissue of the periosteum, fasciae, aponeuroses and tendons, whereas the finer interstitial connective tissue is changed only at a later stage, and the muscular atrophy is only a secondary phenomenon. (GOTO.) And the case under discussion does also support this view, in that at the operation the ossified piece was found lying in an intermuscular septum, while the surrounding muscles were quite intact. There have been many different view concerning the ossification. The inflammatory etiology seems now to have fewer adherents than before, as in several cases which have been histologically examined one has not been able to find the slightest signs

of inflammatory changes, even when specimens have been removed in the acute stage. (GOTO.) Nor have I been able to find any inflammatory changes in my specimens, either in the surrounding connecting tissue or in the muscles. And there seems to be just as little reason to suppose that a tumour is present, as STEMPEL wants to assert, and there are no proofs in support of NIKOLADONI's theory that a trophoneurotic disorder would be the cause. The significance of the trauma has been emphasized by several authors, but a traumatic etiology will not very likely be established by evidence. No other trauma has existed in the present clinical history, beyond those which children are generally exposed to. In all probability one has to interpret the disease as a constitutional disorder. And the microdactylia which is found in a very large number of cases does also argue for this supposition. The primary causes would be a proliferation of the connective tissue, followed metaplastically by an ossification. In a specimen obtained from a case of myositis ossificans LÖHR has recently proved histologically a process of development from normal surrounding connective tissue, via embryonic connective tissue and a cartilaginoid tissue, right to a true bone tissue with a lamellated structure exhibiting a lively apposition and a lacunar resorbtion. In the case under discussion I have not been able to find a similar process of development, which is possibly due to the fact that the process in the examined region seems to have come to a certain finish. It is rather remarkable that the ossified part is surrounded by a quite normal connective tissue poor in cells. No cartilaginous structure is to be found anywhere, and the bone itself resembles mostly the type of a connective tissue bone with no signs of a lamellated structure or fully formed marrow cavities. There has, thus, probably been a metaplasia into bone, which process has progressed comparatively quickly and quite mecanically produced considerable functional disorders in the large joints of the upper extremities, without the muscles being directly injured.

The case ought to be of particular interest, apart from the unique features shown in the roentgenograms, as it shows how some isolated fasciculi in the large connective tissue septa may become changed into bone, without the surrounding tissue exhibiting any changes, just as it also shows how this process may stealthily develop to a considerable extent within a comparatively short time and at an early age.

SUMMARY

The author describes a case of myositis ossificans of a male child aged $2^1/_2$ years. After a period of development of about one year the process had resulted in considerable ossifications in the muscles of the neck, sides of the thorax and of the upper extremities. At the test excision and the pathologico-anatomical examination of the changes in the right upper arm it was found that a long ossification which had been seen in the roentgenogram, was lying in the internal intermuscular septum, without the surrounding muscles exhibiting any changes. There were no signs of a previous inflammation.

ZUSAMMENFASSUNG

Der Autor beschreibt einen Fall von Myositis ossificans bei einem Knaben von $2^1/_2$ Jahren. Nach einer Entwicklungsperiode von ungefähr einem Jahr hatte der Prozess zu beträchtlichen Ossifikationen in den Muskeln des Halses, der seitlichen Thoraxpartien und der oberen Extremitäten geführt. Bei Probeexzision und pathologisch-anatomischer Untersuchung der Veränderung am rechten Oberarm fand man, dass eine lange Ossification, die im Röntgenogramm sichtbar gewesen war, im inneren intermuskulären Septum lag, ohne dass die umgebenden Muskeln irgendwelche Veränderungen zeigten. Anzeichen für eine frühere Entzündung lagen nicht vor.

RÉSUMÉ

L'auteur d'épeint un cas de myosite ossifiante chez un enfant mâle agé de $2^1/_2$ ans. Le processus ayant duré 1 année environ résultait en ossifications considérables dans les muscles de la nuque, des côtés du thorax et des bras. En faisant une excision et un examen pathologique-anatomique des altérations dans le bras droit on y trouva une longue ossification que l'image radiographique avait montrée, dans le septum interne intermusculaire; les muscles autour ne montraient aucun changement. Il n'y avait aucun signe d'inflammation préalable.

RESUMEN

El autor describe un caso de myositis osificante en un niño varón de $2^1/_2$ años. El proceso que duraba alrededor de un año, produjo osificaciones considerables en los músculos de la nuca, en los lados del torax y en los brazos. Efectuando una excisión y un examen patológico-anatómico de las alteraciones en el brazo derecho se encontró una larga osificación ya mostrada por la imagen radiográfica, en el septum interno intermuscular; pero los músuclos alrededor no demostraban ningún cambio. No existía ningún signo de inflamación previa.

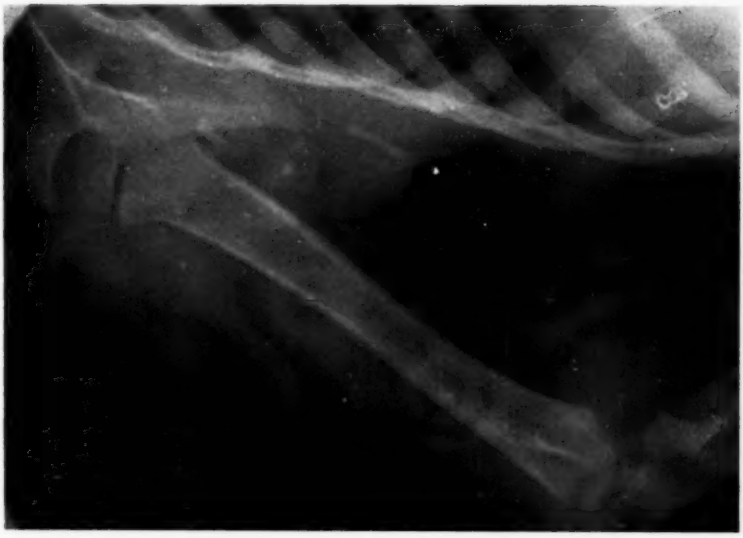

Fig. 2.

Fig. 1.

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FROM THE ROENTGENOLOGICAL DEPARTMENT OF THE COUNTY HOSPITAL, UMEÅ, SWEDEN

A CASE OF INTRATHORACIC CYST

by

Dr. S. Ström †

Benign intrathoracic newgrowths, especially cysts, being very rare, the following case will no doubt be of some interest from a diagnostic point of view.

Woman, aged 39, who in the beginning of 1920 was under treatment for pyelitis and nervous heart trouble at the Maria Hospital, Stockholm.

Roentgen-examination (March 10th 1920): Normal shape and size of the heart. In the right hilus a rounded, sharply-defined shadow quite the size of a mandarin-orange, not pulsating during fluoroscopy.

Because of the roentgen picture obtained one had first to take into consideration whether an aneurism might be present. The shadow, however, was situated rather too far down to be an aneurism originated from the ascending aorta, and it did not show any distinct connection with the aorta. Neither were there any clinical symptoms of an aneurism. On the whole the formation afforded very insignificant signs on percussion and auscultation: only a slight dullness and a reduced respiratory murmur on the left base.

It seemed most probable that a newgrowth of some kind was present, and it was decided to expect for some time to see if the roentgen picture would change in the meantime.

Roentgen-ray examination (April 14th): The shadow in the right hilus has the same appearance as before. On rotating the patient and by shifting the roentgen tube upwards and downwards the shadow was found to be located far back in the thorax close to the posterior thoracic wall. When the examination was made in a left lateral position the shadow made large respiratory excursions, following the movements of the diaphragma.

One now arrived at a diagnosis of an intrapulmonary newgrowth.

An attempt was made to produce a pneumothorax for diagnostic purposes, but failed. As it was now considered that the presence of an aneurism could be precluded, a test puncture was made in a region which had been mapped out on the back during the fluoroscopy. On being inserted the point of the needle at first met with great resistance, as of a thick callosity, but, this resistance having been overcome, a grayish-yellow fluid matter was obtained in the syringe. On microscopic examination this matter was found to contain detritus, scanty mono- and polynuclear cells, but no bacteria. On cultivation on agar and bouillon there was no growth.

The patient was sent the same day to the surgical department with the diagnosis: Chronic, inspissated empyema? Cyst of the lung?

Operation (April 24th 1920, A. Odelberg): Resection of the 3rd rib posteriorly. Beneath the pleura a rounded, firm resistance was felt. When the pleura was split, a cystic formation was encountered, which could be bluntly detached from the pleura and lung. The cyst ended in a point which extended upwards on the anterior surface of the spinal column between this and the oesophagus. On its being detached from here a small hemorrhage occured which, however, was easily stopped.

The healing progressed without any complications.

The dimensions of the excised cyst were $9 \times 5 \times 4$ centimeters. In it were felt some firm parts, probably some calcifications. Microscopic examination (Professor HEDRÉN): The wall of the cyst consists of coarsely fibrous connective tissue, its cells being more abundant towards its lumen. Here and there it encloses also some gland-like formations which are in some places enveloped by round-celled tissue. No sure signs of pleura-tissue are seen in the superficial parts of the wall of the cyst.

There are in the literature two roentgen-examined and operated cases exhibiting a roentgen picture almost identical to this, but being of a different histological nature.

One of them has been described by JACOBAEUS and KEY in their publication on intrathoracic tumours, which is of interest also from a roentgenologic point of view. It is a case of myofibroma originated in the mediastinum (probably in the oesophagus). Its position in the thorax was exactly the same as that of the cyst which has been described above. Yet, with the difference that the tumour was not completely covered by the parietal pleura.

The second case has been published by P. KRAUSE. It is a chondro-osteo-myxo-sarcoma originated in costal periosteum.

Judging from the description one of GARRÉ's cases of mediastinal tumours seems also to have shown a similar roentgen picture: a

dermoid cyst the size of two fists, giving a round shadow to the right of the sternum, melting into the cardiac shadow.

Finally a mention ought to be made in this connection of EDLING's very rare case of a benign, intrapulmonary mixed tumour, the roentgen picture of which simulated a cyst.

SUMMARY

A case of cyst in the right half of the thorax. The roentgen picture revealed a rounded, sharply-defined shadow close to the heart. On looking through the literature on this subject one finds that the same roentgen picture may be obtained of different kinds of tumours: myofibroma, myomatous mixed tumour originated in costal periosteum, and dermoid cyst.

ZUSAMMENFASSUNG

Ein Fall von Zyste in der rechten Thoraxhälfte. Das Röntgenbild zeigte einen runden, scharf umschriebenen Schatten nahe am Herzen. Bei Durchsicht der einschlägigen Literatur findet man, dass ein derartiges Röntgenbild bei verschiedenen Tumorarten vorkommen kann: bei Myofibrom, bei myomatösem gemischtem Tumor, ausgehend vom Rippenperiost und bei Dermoidzyste.

RÉSUMÉ

Il s'agit d'un cas de kyste dans la partie droite du thorax. L'image radiographique découvrit une ombre arrondie, à contours nets près du cœur. D'après la littérature médicale concernant ce sujet une pareille image radiologique peut être dû à différentes espèces de tumeurs: fibromyome, tumeur myomatique mixte ayant son origine dans le périoste costal et kyste dermoïde.

RESUMEN

Se trata de un caso de quiste en la parte derecha del torax. La imagen radiográfica descubre una sombra redondeada, con contornos claros cerca del corazón. Según los tratados médicos sobre este caso, una imagen radiológica como ésta puede atribuirse a diferentes especies de tumores; fibromyoma, tumor myomático mixto, cuyo origen está en el periosto costal y quiste dermoidal.

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FROM THE ROENTGEN DEPARTEMENT OF THE MARIA HOSPITAL, STOCKHOLM.
CHIEF: ÅKE ÅKERLUND, M. D.

ON A PECULIAR «FILM FAULT»

by

Åke Åkerlund, M. D.

In one of the roentgen departments of this country a peculiar fault was observed in a film quite lately, which was supposed to be due to the manufacturing. At the request of the representative here of the firm I have examined the film and subsequently discussed the matter with several roentgenologists. As it is not at all a question of a fault in the manufacturing, as has been supposed, but a phenomenon which apparently is not generally known in roentgenological circles, I have thought that perhaps a short account of i tin this journal might offer some interest.

In the film in question, which is a special picture of the pelvis, one notices (fig. 1) within the pelvic cavity a full-sized negative picture of the white label on the card-board box in which the film is delivered. The details of the label are so distinctly visible that one can even read the warning not to open the film parcel anywhere but in a dark room.

Fig. 1.

How, then, has this negative of the label on the card-board box been produced on the roentgen film, although the label can not, of course, cause the faintest roentgen shadow?

The explanation is furnished by an old and very simple photographic mode of reproduction.

This method was first described in an article by the student A. BREYER of Berlin in the Bulletin de l'académie royale des sciences de Bruxelles in 1839 only a few months after the daguerreotypy had been published (cit. after H. BÄCKSTRÖM in Nord. tidskr. f. fotografi, Vol. 7, pag. 36). After that, the method has fallen into oblivion and been rediscovered several different times, inter alia by J. HORT PLAYER who in 1897 laid it before the Photographical Society of London, and after whom this method is nowadays very often called *playertypy*.

The method is founded on the fact that if one places a paper sensitive to light, a photographic plate or film, over a black picture, drawn or printed on white paper, with the coating in intimate contact with the said picture, and then for a short moment exposes through the sensitive medium, then a large portion of the light will pass through this medium without affecting the sensitive substance; the light is then reflected by the white surfaces of the picture, but not by its black surfaces, and affects the sensitive coating.

Fig. 2.

The playertypy is a simple and convenient method for making a good contrast reproduction of an opaque and subjacent object without the aid of lenses. The principle of the playertypy has later been varied in different ways, the *luminography*, in which the exposure is done by means of some kind of «illuminating colour», being one of the more well-known variations.

At my first attempt I succeeded in getting a good picture of the label on the outside of the card-board box, on the roentgen film in question, both by *playertypy* and *luminography*.

In the first case it was sufficient to place the film against the label on the top of the box and then light an ordinary electric lamp in the dark room for a fraction of a second.

In the second case the exposure was done by placing a «Phosphoreszensfolie» of HOLZKNECHT-JAHODA for a couple of minutes on top of the film which was in contact with the label. (Cf. Fortschritte auf dem Gebiete der Röntgenstrahlen, Vol. XXIX, pag. 501).

The pictures were in both cases very sharp and contrasting and reproduced quite distinctly the finest details of the original.

Fig. 2 is a reproduction obtained in this manner of the label in question.

Thus, it is quite obvious that one must follow scrupulously the instruction not to expose the film to white light even for a fraction of a second, and this rule is especially applicable when the film is placed directly on a white object that reflects the light against the film.

SUMMARY

The author explains the origination of a peculiar «film fault» by recalling the two photographic methods of reproduction, «playertypy» and «luminography».

ZUSAMMENFASSUNG

Der Verfasser gibt durch Hinweis auf die beiden photographischen Reproduktionsmethoden «Playertypie» und «Luminographie» die Erklärung für das Entstehen eines eigenartigen «Filmfehlers».

RÉSUMÉ

La naissance d'un «défaut de film» singulier est expliquée par l'auteur par un renvoi aux deux méthodes de reproduction photographiques, la «playertypie» et la «luminographie».

RESUMEN

El origen de un «defecto de la película »peculiar, se explica por el autor refiriéndose a los dos métodes de reproductiones fotográficas, la «Playertipia» y la «luminografia.»

FROM THE ROENTGENOLOGICAL DEPARTMENT OF THE ACADEMICAL HOSPITAL, UPSALA
CHIEF: DR. HUGO LAURELL.

A PLASTIC MEANS OF PROTECTION FOR THE X-RAY TREATMENT

by

Sigfrid Arnell, M. L.
Assistant at the Roentgenological Department

In number one, volume XXXI of "Fortschritte auf dem Gebiete der Roentgenstralen" ALFRED RÓNA announces a plastic means of protection for the X-ray treatment, consisting of equal parts of red oxide of lead and modelling-clay. This means of protection was meant to facilitate the isolation of irregularly formed surfaces, for instance at the treatment of cancroids in the face. When this plastic mixture was tested at the Roentgenological Department of the Academical Hospital, it proved to be impaired by some drawbacks, above all it was very sticky and felt cold and unpleasant for the patient. So I made some experiments to find some other plastic material, more appropriate for the purpose than clay.

Among the different materials I have tried, I have found that the most appropriate is paraffin at a melting-point of 45° C at most. The plasticity was kept when one part of paraffin was mixed whith up to five or six parts of red oxide of lead (Pb_3O_4) or litharge (PbO). The latter is to be preferred to red oxide of lead on account of its greater percentage of lead (> 92 % against > 90 %) and less tendency to stain. A mixture of one part of parafin with five parts oxide of lead has a specific gravity of about 3,5. Thus a layer of the mixture, 4,3 mm thick, contains lead equivalent to leadplate, 1 mm thick. At a photographic determination of its protective capacity 4—4,5 mm of this plastic mixture seem to equal 1 mm of lead. In order to avoid the danger of lead-poisoning a mixture of paraffin with $BaSO_4$ was also produced. The greatest percentage of barium at which the mixture proved to be plastic was three parts of $BaSO_4$ to one part of paraffin. 1 cm of this plastic mixture equals 1 mm of lead.

This means of protection made of paraffin is neither sticky nor cold and is not in any respect unpleasent to the touch. It remains plastic even at a temperature rather lower than that of the human body and does not melt in the heat radiating from the tube at the usual distance for radiation. It solidifies when cold, but if kept

near a radiator it remains plastic enough always to be fit for use. It is easily sterilized by heating, but one must see to it that the mixture is stirred while cooling down till it has solidified. Otherwise it becomes unhomogeneous, as the oxide of lead precipitates in the melted paraffin. The mixture can eseaily be rolled out into a sufficiently thick layer by means of a roller, which very well can be done on a stone slab, to which are applied edges of the same height as the wished for thickness of the mixture. At the isolation of the surfaces at for instance the treatment of warts I have proceeded as follows. The mixture has been given the thickness desired (about 1 cm) and has been applied to the skin when, by pressing the mixture hard against the skin, an impression of the warts has been obtained. Then the mixture has been removed, and a hole for each wart has been made whith a knife. After the replacing of the mixture in its former position on the skin, the holes over the warts have been given a final adjustment.

SUMMARY. The author describes a plastic means of protection for the X-ray treatment, consisting of one part of paraffin with a melting-point of 45° C and five parts of litharge (PbO). A layer of this mixture, 4,3 mm thick, has a protective capacity equivalent to leadplate, 1 mm thick. It is meant to facilitate the isolation of irregularly formed surfaces, for instance warts or cancroids.

ZUSAMMENFASSUNG. Der Verfasser berichtet über eine plastische Abdeckmasse für die Röntgentherapie. Sie besteht von einem Gewichtsteil von Paraffin (Schmeltzpunkt 45° C) und fünf Gewichtsteilen von Bleioxyd (PbO). 4,3 mm von dieser Abdeckmasse entspricht 1 mm Blei. Die Aufgabe dieser Abdeckmasse ist die Abgrenzung von unregelmässig geförmten Feldern z. B. bei Warzen und Kancroiden.

RÉSUMÉ. L'auteur donne communication d'une masse plastique préservatrice dans l'emploi des rayons Röntgen et qui est composée d'une part de paraffine au point de fusion de 45° Celsius pour cinq parts d'oxyde plombique. 4,3 millimètres de cette masse équivaut à une plaque de plomb de 1 millimètre. L'emploi de cette masse plastique a pour but de délimiter les surfaces irrégulières, telles que verruces, cancroïdes, etc.

RESUMEN. El autor da una relación de una substancia plástica preservadora en el empleo de los rayos Röntgen y que se compone de una parte de parafina, con un punto de fusión a 45° Celsius y cinco partes de óxido de plomo. 4,3 milímetros de esta substancia equivalen a una chapa de plomo de 1 milímetro. El empleo de esta substancia plástica tiene por objeto limitar las superficies irregulares, tales como verrugas, cancroidos, etc.

A SIMPLIFIED DOSIMETRIC METHOD IN GYNECOLOGICAL DEEP ROENTGENTHERAPY

by

Axel Westman

In the evolvement of the modern gynecological radiation therapy for cancer there is one problem in particular which has excited great interest, the technique of administering a homogenous radiation of the pelvis. In many cases the tumour is, as we know, not localized exclusively to the uterus, but is disseminated also to the parametria and glands situated at the pelvic walls and up along the aorta, and in order to reach these foci with efficacious radiation doses one has tried to carry out a homogenous radiation of all the tissues contained in the pelvis. To accomplish this aim one has proceeded along two different roads, partly by irradiating the pelvis through a number of small portals of entry and with comparatively short skin-focus distances, and partly by employing some few fields of entry and long distances.

Either of these methods seems theoretically feasible, but they offer great difficulties in practical work. The method of employing many fields of entry, represented by WINTZ and others, is so well known that only its principal manner of procedure will be briefly touched upon in this connection. WINTZ delivers his doses in fields of generally 6 × 8 cm. at a distance of from 23 to 30 cm., uterus being irradiated in six sittings with three fields from the front and three from behind and with centering on the portio uteri. After an interval of six weeks from this series he irradiates one of the parametria, also through six fields, and after an additional six weeks the other parametrium is irradiated in a similar manner. As to this manner of procedure one must profess the theoretical doubt that if one believes, as SEITZ and WINTZ do, in the danger of irritative doses — which is a very contested question — then it can only be considered inappropriate to carry out a homogenous irradiation for such a long period as twelve weeks, as, of course, it is obvious that at the first irradiation of the uterus, a certain area of the

parametria will receive an irritative dose which is only compensated six or twelve weeks later. This method is also very difficult to realize in practical work, even if one employs a fluoroscopic screen introduced into the vagina by way of control when centering toward the portio uteri.

The method indicated by WARNEKROS seems, indeed, much simpler. From measurements carried out on a water-phantom he has reckoned to be able to irradiate the pelvis through four fields of entry, one from the front, one from the back and one from either side, so that the variations in intensity at the different areas within the pelvis are kept within moderate limits, from 71 to 131 % of the unit skin dose, the highest values lying in the periphery of the lateral portions of the pelvis and the lowest values in neutral regions e. g. the vertebral column, etc., where there are no suspicious foci. To be able to carry out an irradiation like this it is, however, necessary to adjust the cones of rays so that they cut each other at a certain point in the centre of the pelvis, and it is by no means an easy matter to determine this point exactly in each special case. The focussing is made still more difficult by the fact that one is not centering on plane surfaces but often on very curved surfaces, and another difficulty comes in, too, which is found within the patient herself, for if she is big and thick or small and thin the percentage of absorbtion will vary in an essential degree, and the chart prepared by WARNEKROS cannot be fully applied to all variations. And he says himself that the fields of entry have to be diminished in thin patients, though it is, of course, difficult to estimate how much in each particular case. In estimating the distribution of radiation within the pelvis, WARNEKROS has transferred the values, which he has obtained by making measurements at various depths of the water-phantom, to pelvic diagrams drawn from the pelvic dimensions of the several patients.

In order to simplify as far as possible the dosimetric technique I have employed a phantom of wax-plastic in my investigations into the distribution of radiation in the pelvis under various conditions, the behaviour of the wax-plastic toward the absorbtion, dispersion etc. of the roentgen-rays being, as experience has shown, the same as that of the body tissues. The wax-phantom has been made in such a way that its shape and size correspond to the pelvic region as measured from a series of heavily built patients, the pelvic region denoting then the region between a horizontal plane on a level with the anterior superior iliac spines and a plane through the external orifice of the vagina. The measures of the phantom, which had almost the shape of a frustum of a cone flattened from before back,

were, according to this estimation: height 20 cm., longitudinal upper diameter 27 and transverse diameter 24 cm., lower longitudinal diameter 33 and transverse diameter 27 cm. In the base of the cone I had had a series of cylindrical holes made which reached to half the depth of the phantom. The holes were made just so wide as to allow the introduction of the ionization chamber of one of Reiniger, Gebbert and Schall's ordinary iontoquantimeter, without there being any space between the ionization chamber and the wax. To the holes belonged further some wax-plugs which could be inserted into all the holes but the one where the ionization chamber had been placed at the time (Fig. 1).

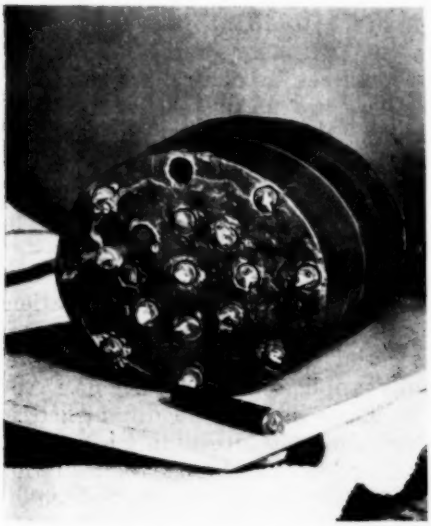

Fig. 1. The pelvic phantom.

In order to simplify the dosimetric technique still more, I have practised the procedure advanced by JÜNGLING in irradiation of tuberculous joints. He employs a cubic cardboard form which encloses the joint, and he fills up the spaces between the skin and the cardboard box with bolus alba which behaves towards the distribution and dispersion etc. of the roentgen-rays in the same manner as the body tissues. In this way he eliminates the difficulties which are caused by the shape of the joint, and reduces the problem to a homogenous irradiation of a regular geometric figure. In a similar way I have thought it would be possible to transform the pelvic region to a regular geometric body. To that end I have constructed a wooden frame, the sides of which are easily movable in relation to one another and can be fixed with screws in any position desired. When carrying out my measurements I have then proceded in this way. The pelvic phantom has been enclosed in the frame, and the interspaces between the sides of the frame and the curved surfaces of the phantom have been filled out with cloth-bags containing bolus. The frame has then been placed on an ordinary lamp stand, so that the whole arrangement can be raised and lowered and each hole in the phantom adjusted on a level with the ionization chamber of the ionto-quanti-

meter, which latter is protected behind a lead screen. Then ionto-quantimeter estimations are made for each hole (Fig. 2). There are altogether 17 holes, one in the centre, a series of eight holes round the periphery, and one series of eight holes in a circle halfway between the centre and the periphery, these positions corresponding approximately to the uterus, parametria and skin resp.

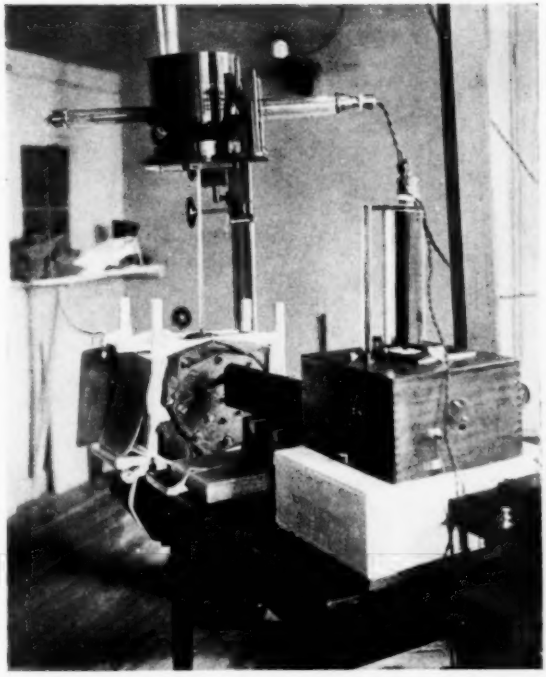

Fig. 2. Arrangements for measuring the roentgen doses within the pelvic phantom. In the picture the lead screen which was set up at the measurements between the pelvic phantom and the ionto-quantimeter, is removed.

If, through measurements on the pelvic phantom, one has satisfied one self that one has got efficacious roentgen doses everywhere, the results may be directly applied to the therapeutic work. The pelvic region of the patient who is going to be treated is enclosed in the frame which is adjusted as in the measurements on the phantom, the spaces are filled out with bags of bolus, and the same doses are delivered as in the measuring experiments. (Fig. 3.) In

this way one gets a good idea of the distribution of the radiation intensity in the pelvis.

It seemed to me to be of a theoretic interest to find out under what conditions it would be possible to obtain in the simplest way a homogenous irradiation of the pelvis, and by measurements on the phantom I have found that it is accomplished most easily by employing four fields of entry and a skin-focus distance of 60 cm. For

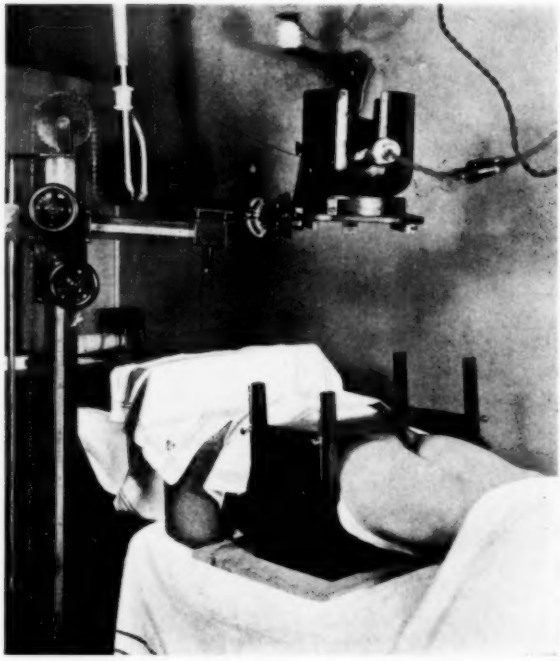

Fig. 3. Patient in the radiation frame.

source of light I have used a Coolidge tube, with a Siemen's inductor and a filter of half a millimeter of copper, which gives a deep dose of 18 % at a depth of 10 cm. with a skin-focus distance of 23 cm. and a field of entry of 6 × 8 cm. The great skin-focus distance has proved necessary in the cases under discussion where it is a question of irradiating a body of such a considerable size, as the loss of radiation intensity outside of the central ray becomes so heavy, as compared with what it is when small fields of entry are used. At the same time, however, the percentage of the deep

dose in increased, and it has been found that to be able to apply a skin unit dose in the deep, with these arrangements, one has to irradiate each field with three-fifths of a skin unit dose. From the diagram (Fig. 4) it will be seen how the intensity is distributed within the phantom. The variations of intensity range between 101 and 122 per cent of a skin unit dose. At least a whole skin unit dose is scattered within the entire pelvic region, and the highest values, 122 per cent, do not come up to what in practical work is called the skin maximum dose, beyond which the risk of burns begins. The homogenous irradiation of the pelvis is, thus, technically fairly easy to accomplish with the aid of these comparatively simple arrangements. The great difficulties which have existed in the centering of the lamp, have been eliminated, and no reductions need be made for variations in the size of the patients. The exact technique of irradiation has, thus, been simplified, but very likely the opinion will prevail more and more that the cancer therapy is not solely a roentgeno-technical problem, as many have wanted to assert in these last years. To the large doses it must be objected that they have a strong general influence on the organism, which influence manifests itself by changes in the blood picture of the patient, the more so the greater the body regions irradiated. In the homogenous irradiations of the pelvis, very great areas of the organism will be irradiated which are not generally a seat for tumour foci, e. g. pelvis, the trochanteric regions etc., and this must be said to be a great disadvantage. With the aid of the simplified dosimetric technique offered by the pelvic phantom I hope I shall later on get the opportunity of investigating how far it may be possible to avoid this disadvantage.

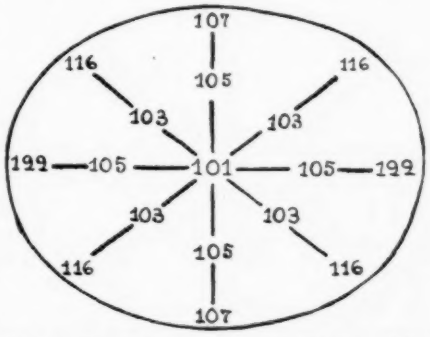

Fig. 4. The diagram of the distribution of the intensity in the pelvic phantom. The figures give the percentage value of the superficial doses.

SUMMARY

The author has described a simplified method for measuring the distribution of radiation within the pelvis in gynecologic deep roentgentherapy. A phantom has been made of wax-plastic, corresponding to the pelvic region

of a heavily built patient. A certain number of cylindrical holes have been made in the phantom, extending to half its depth. The holes are made just so large that the ionization chamber of an ordinary ionto-quantimeter can be introduced into them. In this way, measurements may be carried out at different places within the phantom. In order to simplify the problem of centering, the phantom has been enclosed in a wooden frame, in accordance with a method advanced by JÜNGLING, and the spaces between the frame and the curved surfaces of the phantom have been filled out with bolus alba. The results of the measurements on the phantom can be directly employed in the therapeutic irradiations.

ZUSAMMENFASSUNG

Der Verfasser beschreibt eine vereinfachte Methode zur Messung der Verteilung der Strahlung innerhalb des Beckens bei gynäkologischer Röntgen-Tiefentherapie. Aus plastischem Wachs wurde ein Phantom entsprechend der Beckenregion einer kräftig gebauten Patientin angefärtigt. In das Phantom wurden eine gewisse Zahl von zylindrischen Löchern gemacht, die bis zur Hälfte seiner Dicke in die Tiefe reichen. Die Löcher sind gerade so gross, dass die Ionisationskammer eines gewöhnlichen Ionto-Quantimeters in dieselben eingeführt werden kann. Auf diese Weise können an verschiedenen Stellen im Phantom Messungen ausgeführt werden. Um das Problem der Zentrierung zu vereinfachen, wurde das Phantom, einer von JÜNGLING angegebenen Methode gemäss, in ein kistenartiges Holzgestell eingeschlossen, und der Raum zwischen dem Gestell und den gewölbten Oberflächen des Phantoms mit Bolus alba ausgefüllt. Die Resultate der Messungen am Phantom können direkt bei den therapeutischen Bestrahlungen verwendet werden.

RÉSUMÉ

L'auteur décrit une méthode simplifiée pour évaluer la distribution des rayons dans le bassin en radiothérapie gynécologique profonde. Il a fait une reproduction du bassin en cire à modeler dont les dimensions correspondent à celles d'un bassin d'un sujet de forte corpulence.

Un certain nombre d'excavations cylindriques a été pratiqué dans ce modèle en cire allant jusqu'à la moitié de sa profondeur. Le calibre des excavations est tel qu'il permet exactement l'introduction de la chambre d'ionisation d'un iontoquantimètre ordinaire. Par ce moyen il est possible d'opérer des mensurations dans differents endroits du modèle. Afin de simplifier le probléme du centrage le modèle a été enfermé dans un cadre en bois d'après le procédé de JÜNGLING, et l'espace entre le cadre et les surfaces courbes du modèle a été rempli de Kaolin. Les résultats obtenus par la mensuration dans le modèle en cire peuvent être directement utilisés pour l'irradiation thérapeutique.

RESUMEN

El autor describe un método simplificado para avalorar la distribución de los rayos en la pelvis en radiografía ginecóloga profunda. Ha hecho una reproducción de la pelvis en cera de moldear cuyas dimensiones corresponden a las de la pelvis de un individuo de gran corpulencia.

Se practicaron una serie de excavaciones cilíndricas en este modelo de cera, ll egandohasta la mitad de su profundidad. El calibre de las excavaciones es tal, que permite exactamente la introducción de la cámara de ionización de un iontocuantímetro ordinario. Por este medio resulta posible obtener mediciones en diferentes puntos del modelo. A fin de simplificar el problema del centraje, el modelo ha sido encerrado dentro de un marco de madera, según el procedimiento de JÜNGLING, y el espacio entre el marco y las superficies curvas del modelo se rellenó con caolín. Los resultados obtenidos por las mediciones en el modelo de cera, pueden utilizarse directamente para la irradiación terapéutica.

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PROCEEDINGS OF THE DUTCH SOCIETY FOR ELECTROLOGY AND RÖNTGENOLOGY

46th Meeting on Sunday 13th May 1923

President: Dr. D. H. van der Goot.
Secretary: Dr. N. Voorhoeve.

I. *In Memoriam Prof. von Röntgen.*

The president commemorates in consequence of the death of Prof. von Röntgen the great significance, this learned man has had for whole science and especially for that branch, exercised by this society. As a short time ago the merits of von Röntgen have been analysed in our society by Prof. Haga and by Prof. Wertheim Salomonson as from physical and as from medical point of view, we may refer to those papers. In honour to his commemoration all members rise from their seats.

II. H. Timmer: *Something about the Intensifying Screen.*

The photographical plate only absorbs a small part of the x-rays, 99 % according to Kodak go through. The intensifying screen enables us to use a great deal of this part to deliver the image. The screen is covered with a layer of fine cristals of $CaWO_4$ that give a blue violet fluorescention, for which light the photographical plate is more sensitive than for x-rays. When we cover a photographical film or plate with an intensifying screen the combination acts as follows:

1. A part of the primary x-rays causes scattered x-ray radiation in the intensifying screen.
2. A part of the (primary) x-rays causes fluorescention in the intensifying screen.
3. A part of the (primary) x-rays causes kathoderadiation in the intensifying screen.
4. A part is absorbed in the silverlayer.
5. A part goes through the whole of plate and screen (perhaps about $^1/_3$).

Radiographing in this way a part of the body, the image is caused by the primary x-rays and the fluorescention of the intensifying screen. The photochemical action of the last is more extensive than of the x-rays, so that the time of exposure can be reduced to $^1/_4$—$^1/_{10}$ and less. Hard rays do not cause such strong fluorescention as soft rays. Glocker finds more fluorescention with hard rays.

Must the intensifying screen lay above or beneath the plate?

When we lay the screen under the plate or film, the photographical effect for the film will be the same as when the screen lays above, but not

for the plate. The glass absorbs and scatters a part of the penetrating x-rays, so that the intensifying screen radiates weaker. Using plates we must lay the screen above.

I have demonstrated the great influence of the intensifying screen in the following way:

A photographical plate is covered half with an intensifying screen. Between the screen and the plate a piece of black paper is laid, so that the screen cannot lighten the plate. On the other half of the plate two strips of aluminium are laid 2 and 4 m.m. thick. Next we radiograph a hand. We see on the negative that the absorbtion of the intensifying screen is about equal to 4 m.m. Al. Of course this is only intended for the used time of exposure, when we expose longer also through the intensifying screen, so many x-rays will penetrate, that the image has obtained a maximum of intensity.

Duplitized films and simple films can be used with two screens. Considerated in a perfunctory manner one could think, we then only use the half of the time, of exposure, but this is not so. The upper screen absorbs a part of the x-rays (4 m.m. Al.), so that the underscreen receives less x-rays and gives a weaker fluorescention. I have confirmed this by the next experiment.

I have laid a duplitized film on an intensifying screen and covered the upper side of the film for the half with a second intensifying screen. Further I laid a piece of black paper between the upperscreen and the film. I then photographed at the same time two hands of the same person, on each half of the film one hand. You see the image on the uncovered half much clearer than on the covered half. The first image is the image obtained with one screen (if this had laid on the film, the image would be the same because the absorbtion of the thin film can be neglected). The second image is the image obtained by the underlaying screen, when the rays have already passed the upperscreen. The direct effect of the x-rays on both silver-bromide-layers of the film may be neglected, because this is of no moment and is equally influenced by them on both photos. Both images demonstrate the action of either of the intensifying screens, when using two. Manufacturers have understood the difference in action of the two screens. Kodak observes that the upperscreen must be thin; the Imperial Comp. supplies an underscreen, that is more opaque for x-rays than the upperscreen and can therefore absorb harder rays. Most of you, who are accustomed to develop films personally, must have observed, that the image in the upperside of the film appears earlier and stronger, than the image on the backside. From this phenomenon I concluded that the layer of the underside was exposed less and I took the mentioned experiment.

A few more remarks. When we use an intensifying screen, the developping lasts longer. The silver-bromide is altered by violet light, especially at the surface and not as by x-rays in the whole depth. The developping for that reason begins at the surface and very slowly goes deeper; the image appears later on the backside.

Some radiographers use common photographical plates with the intensifying screen. Experience has taught, that x-ray plates are in general better, especially for radiographing thick parts of the body, because the rays, that strike the screen, are in this case harder and for this reason cause less fluorescention, so that the photo is formed for a great deal without the

help of the intensifying screen. For thinner parts of the body, where the blue violet light of the screen is almost alone responsable for the photo, it seems to me, that photographical plates or films are as good as x-ray plates.

Technique, instructed by science, must try to fabricate films and screens sensable for x-rays of definite wavelength, what is possible in common photography must be possible also in radiography.

III. L. G. HEILBRON: *Demonstration of a New Potter Bucky Diaphragma.*

The P. B. diaphragma, moved by means of aircompression is very well calculated for American tubes, that can stand heavy charges for a longer time. In general we do not use such tubes in our country and in Europe we like to use tubes with a small focus. We therefore want a much longer time of exposure than is possible with the P. B. diaphragma as is sold by the Americans. For that reason I constructed a new kind of P. B. diaphragma. The grid, when having reached the extreme position, comes back automatically. This devise was possible, by using an electric motor with a set of gear wheels and a wormweel. The slowly running wormwheel is used to move the grid. About a second before the grid reaches the end of its path, an electric bell is switched on. This bell rings till the grid has returned. During the ringing of the bell the hightensiontransformer has to be switched off. With this Potter Bucky Diaphragma it is possible to enlarge the time of exposure as much as we like, so that it becomes possible to use tubes with finest foci.

Discussion. VAN EBBENHORST-TENGBERGEN asks, whether it is necessary to switch off the hightensiontransformator every time the grid reaches the end of its path. HEILBRON answers it is not necessary, when the grid goes up and down several times during the exposure, but that it must be done, when this occurs only one or two times during the exposure.

IV. L. G. HEILBRON: *The X-Ray Spectrum.*

The light from an x-ray tube is not homogeneous. Formerly they thought the reason of this fact is the difference of velocity of the electrons striking against the target; but even the Coolidge tube connected to constant high tension, gives a compound spectrum. None of the methods, used with ordinary light, to get a spectrum, can be used to give an x-ray spectrum. W. H. BRAGG and W. C. BRAGG, father and son, have invented a method to analyse the x-raylight into a spectrum. After the experiments of LAUE, it became clear that a cristal could serve as a space lattice to produce a phenomenon of interferention with x-rays. The BRAGG's have profited of this property of the cristals for their x-rayspectrometer.

Fig. 1 is reproduced with description from BRAGG's x-rays and crystal structure.

Let the crystal structure be represented in Fig. 1 by the series of planes, p, p, p.-d being their common distance apart or 'spacing'. A, A_1, A_2, A_3 are a train of advancing waves of wave length λ.

Consider those waves which, after reflection, join in moving along BC, and compare the distances which they must travel from some line as AA'' before they reach the point C. The routes by which they travel are ABC,

A′B′C, A″B″C and so on. Draw BN perpendicular to A′B′. Produce A′B′ to D, where D is the image of B in the plane through B′. Since B′B=B′D, and A′N = AB, the difference between A′B′C and ABC is equal to ND, that is to $2 \sin \theta$. Similarly, A″B″C is greater than A′B′C by the same distance, and so on.

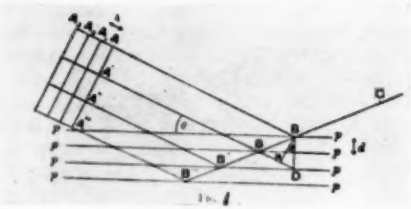

Fig. 1.

If DN is equal to the length of the wave, or is any whole multiple of that length, all the wave trains reflected by the planes p, p, p, are in the same phase and their amplitudes are added together. If DN differs but slightly from the wave length, say by a thousandth part, the many thousand reflections bear all sorts of phase relations with each other, and the resultant amplitude is practically zero. We see, therefore, that when a monochromatic wave train is allowed to strike the face of the crystal, it is only when the glancing angle has certain values that reflection takes place. These values are given by

$$\lambda = 2d \sin \theta_1$$
$$\lambda = 2d \sin \theta_2$$
$$\lambda = 2d \sin \theta_3 \text{ etc.}$$

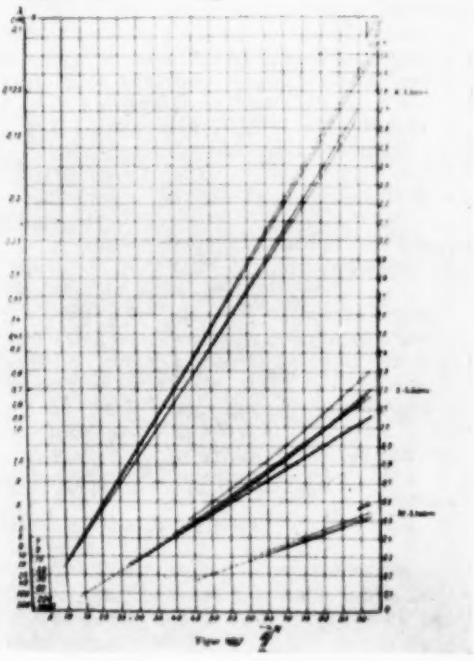

Fig. 2.

Till so far Bragg.

The x-rayspectrum consists of a continuous spectrum covered by wavelengths depending from the metal, the target is made of. These rays belong to the so called characteristic radiation of the target. Barkla and Sadler were the first experimentators, who studied characteristic radiation as secundary radiation. They found two series of characteristic radiation, the K and the L serie, which they thought both consisting of homogeneous rays. With rising atomic weight, the wavelengths of the K and L radiation get regular smaller. We now know that the K radiation consists of four components and that the L radiation is more compound. The relation between atomic weight and wavelength of characteristic radiation is also better known now.

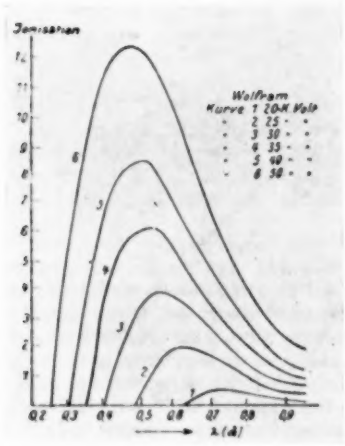

Fig. 3.

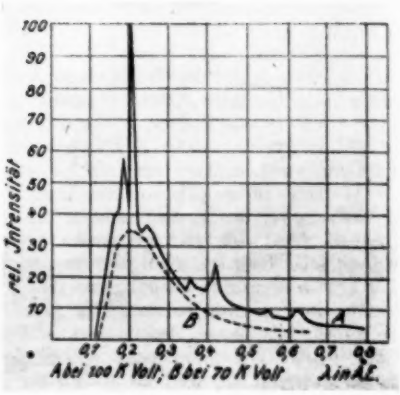

Fig. 4.

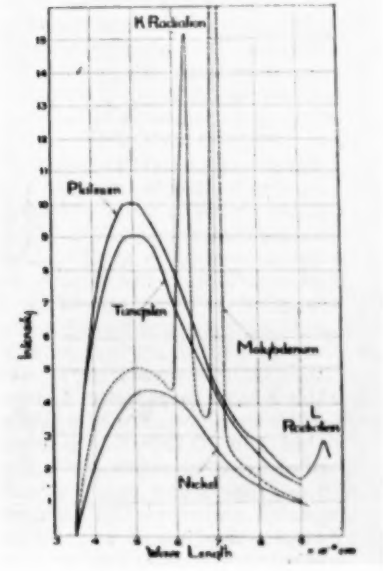

Fig. 5.

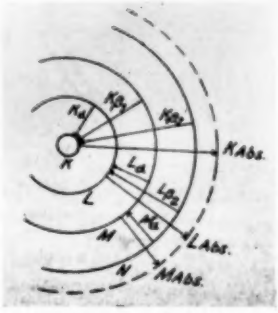

Fig. 6.

MOSELEY established in 1913 and 1914 the law called after him, showing that the square root of the frequency of each of the characteristic rays mount regularly with the atomnumber; the square root of the frequency is a linear function of the atomnumber. (Fig. 2 reproduced from DAUVILLIER.)

This law made it possible to prophesy the existence of 5 unknown elements. Later a M serie was discovered and some want a J serie to exist. The continuous part of the spectrum is caused by the brake of the speed of the electron. The smallest wavelength present in this part of the spectrum, only depends of the tension of the apparatus according to the law of DUANE and HUNT: $\lambda = \frac{12 \cdot 35}{V}$. The time disposal for this paper is too short to discuss this formula.

From a number of curves, reproduced from different authors, we may learn something of the principal qualities of the x-rayspectrum.

Fig. 3 reproduced from ULREY, shows the intensity distribution for the brake spectrum of tungsten at different tensions from 20—50 KV. It appears from this fig.:

1. That when the tension gets higher, the smallest wavelength becomes smaller (DUANE and HUNT's law).
2. That at each voltage, there is one wavelength with maximum intensity.
3. That, when the voltage increases, the wavelength with maximum intensity comes nearer to the minimum wavelength.

Fig. 4, reproduced from HULL, shows intensity distribution in the spectrum of a tungsten target with 70 and with 100 KV.

It appears from this fig.:

1. That with 70 KV. only the brake spectrum is seen.
2. That the smallest wavelength is smaller with 100 than with 70 KV. (DUANE and HUNT).
3. That 70 KV. is not enough to excite the characteristic radiation of tungsten.
4. That the K radiation of tungsten is very distinct with 100 KV. The wavelength of the L radiation of tungsten is too large to occur in this fig.

Fig. 5 shows a set of curves from ULREY again to demonstrate distribution of intensity in the x-rayspectrum. These curves were made with a tube with a turnable target, built of different metals: Ni, Mo, T, Pt. The tube worked at a tension of 35 KV. From these curves we see:

1. That the smallest wavelength does not depend of the material of the target and only of the tension.
2. That the intensity of the radiation from the tube increases with the atomweight of the target.
3. That nothing is seen of the characteristic radiation of the Ni target because the wavelength of K and L radiation of Ni are larger than 1 Ae 10^{-8} c.m.
4. That the Mo curve shows an intensive K radiation; the L radiation is invisible, because the wavelength is larger than the fig. allows.
5. That the T and Pt curve do not show K radiation, because the tension is too low.
6. That the tension is high enough to cause the L radiation with a wavelength small enough to fall within the fig.

Fig. 6 from SOMMERFELD, shows how K and L radiation arise, in connection with the atommodel of BOHR, consisting of a nucleus and shells of electrons. When an electron goes from a more to a less excentric shell, the energy coming free is transmitted into radiation. When the electron passes to the first shell a K ray is born; when the electron comes from a peripheral shell to the second shell, we get a L ray.

The short time at disposal for this paper, makes it impossible to tell more about other interesting things of the x-rayspectrum.

V. T. WESTERDYK: *Demonstration of the Spectroscope of* MARCH, STAUNIG *and* FRITZ.

In therapeutical as well as in radiographical work, the want of an instrument to measure the wavelength of the x-rays was felt. The earlier penetrometers are of no use for deep therapy. Instead of this, they begin to measure the primary tension of the x-ray transformer, hoping to be able to find in this way the secundary tension, from which hardness depends. This way of measuring secundary tension is not reliable.

The x-ray spectrometer as used in physical laboratories is now simplified and has become an instrument for the medical man.

In HEILBRON's paper we have seen, how at each position of a cristal, only one wavelength of a pencil of x-rays is reflected. In the apparatus of MARCH, STAUNIG and FRITZ, the reflected rays fall on a fluorescent screen. By turning the cristal, we can find a position, where the shortest wavelength is reflected. On a scale we can read the wavelength of the reflected ray. With the law of DUANE and HUNT we can reckon out the tension.

Discussion. ARISZ asks, if it is also possible to measure the intensity of x-rays with the apparatus.

WESTERDYK answers, that it was possible with the first apparatus which had an ionisation room. It is also possible with the instrument from SEEMANN, where the spectrum is caught on a photographical plate, where upon the intensity can be measured with a fotometer. But it is a drawback, that in some circumstances the silver of the photographical plate provokes heavy mistakes. These mistakes cannot be made with the demonstrated apparatus, though the intensity cannot be measured with it.

VI. E. PENSO: *A Typical Trophycal Disturbance* (will be published in extenso in the Acta radiologica).

Discussion. VOORHOEVE, who radiographed this patient, is thankful, PENSO has demonstrated this case. He thinks this radiograph is an unicum.

VII. W. CHR. VAN DER LINDEN: *Radiography of Gallstones.*

An occasionally very fine radiograph of a gallstone, leads me to demonstrate this radiograph and to draw the attention to a paper about this subject by DUVAL, CATELLIER and BECLÈRE in the Archives des Maladies de l'Appareil digestif et de la Nutrition. By experiments with injections followed by radiography, the inconstancy of the place of the gallbledder is studied in the dead body. The authors radiograph the patient laying on the abdomen in a posto anterior direction, the chest being raised (lordosis). Lendmarks are: processus spinosi of the lumbarspine; the right 12th rib and

the right cristailiaca, the central-ray being directed three fingers above the third part of the line combining the processus spinosi of the lumbarspine. It is useful to inflate stomach and darm as well as applying a pneumoperitoneum. The quantity of lime in the stones is not of such great significance as is often thought. The authors found very fine stoneshadows with a group of stones, having a quantity of lime from 0,068 up to 27,8 %. By burning the stones with little quantity of lime a scent of burning horn was smelt. They do not contend cholesterine, and must consist of an unknown organical matery.

Discussion. VOORHOEVE remarks that by inflating air in stomach or darm according to his experience, the results do not become better but worse. Pneumo-peritoneum does not give better results when we study the communications there about critically. The difficulties with radiography of gallstones are caused for a great part by gall in the gallbledder. The importance of this fact is well illustrated by an experiment by VOORHOEVE communicated in this society formerly.[1] Cholesterinestones lighter than water, containing only a very little quantity of lime, laid between two layers of meat, measuring in total 10 c.m., also show the smallest stones on the radiograph. When we make a cavity in one of the layers of meat and fill it up with gall or with water and the gallstones, we only see a very faint shadow of the biggest stones. The quantity of lime also is of great significance for the possibility to get a shadow of the stone. The quoted french communication does not allow to conclude, that the quantity of lime is of secundary importance. When the quantity of lime from a group of gallstones is so different as in the fall given by these authors, the question is, if the stones containing a small quantity of lime were to be seen on the radiograph. We ordinarily see only a few of a large number of stones on the radiograph and those are the stones containing most lime. He therefore asks, if all the stones were found on the radiograph taken in vivo. He draws attention to the fact, that especially in America and England the radiographical examination of gallstones is cultivated with good success and Voorhoeve himself proved by his personal experience, communicated in a paper read in this society, that with a perfect technic it is possible to find gallstones on the radiograph in 50 % of the cases.

VAN DER LINDEN answers, that in the gallbladder of his patient a small quantity of gall was found; this proves, that gall is no hindrance to radiography the stones. As to the stones containing a small quantity of lime, they were not radiographied in vivo, but after they had been removed by the surgeon. A reproduction of the radiograph is showed.

VOORHOEVE remarks, that the small quantity of gall found in the gallbladder proves only, that gall is no absolute hindrance for the radiography of gallstones, a fact, which is generally known, but it is not allowed to conclude by this, that the presence of gall is of little importance. He states, that no argument has been given to conclude, that the quantity of lime is of secondary importance for getting the shadows of the stones.

VIII. N. VOORHOEVE: *An Unknown Radiographical Image of An Anomaly of the Skeleton.* Classifications and remarks. (Will be published in extenso in the Acta radiologica.)

[1] N. VOORHOEVE, Proc. Dutch Soc. of Röntg. 30/11 1913.

Discussion. JANSEN: In the paper of VOORHOEVE is said that no histiological examination is known of a real case of the morbus of Ollier, but a case of his was examined microscopically and in the affected bones on different places cartilagineous tissue, growing rankly, was seen as supposed by VOORHOEVE.

IX. M. L. VAN DER STEMPEL: *Sacralisation of the 5th Lumbar Vertebrae.*

Lady of 30 years complains of 9 years lumbarpain. Since a year much worse. In the latter time creaking feeling in the underpart of the lumbarregion. On the radiograph we see the sacralisation of the left processus transv. of the 5th lumbar vertebra. In American and French litterature many articles about this subject occurred in the latter time.

RICHARD divides his cases in four groups (American Journal of Roentgenology, vol. VI, page 434). All patients have the same complaints, they have pain since a few days till a few years, but never before their 21th year. Accident is seldom a cause of the pain.

JAPIOT (Journal de Radiologie et d'Electrologie, Tome V, p. 145) thinks that an accident can cause the beginning of the pain.

TURINI (Revue med. de la Suisse Romande 1922—Fortschritte Bd. XXX, p. 599) says that sacralisation of the 5th lumbar vertebra is a congenital anomaly. Pain only begins between 21 and 30 years, because then ossification is complete. The pain arises because the 5th lumbar radix leaves the spine between proc. transv. V and sacrum.

A diathermy-treatment gives much relief but the situation upon the radiograph remains the same. RICHARD and JAPIOT advise radiotherapy. TURINI advises rest and when necessary operation. I cannot imagine how x-ray-therapy can help, but knowing the enthousiasm of the French, I shall apply a series of radiations, before advising the patient to be operated on.

Discussion. HEILBRON does not believe that the pain of the patient of VAN DER STEMPEL has anything to do with the anomaly of the 5th lumbar vertebra. This vertebra often shows anomalies, but generally just not in the cases of lumbarpain and ischias. The treatment with diathermy or with radiotherapy seems to him to be quite irrational.

VAN DER STEMPEL remarks that the pain by pressure was just felt on the place of projecting part.

STENVERS does not believe that this anomaly is an indication for operation. Sacralisation of the 5th lumbar vertebra is seen without ischias, and ischias without sacralisation of the 5th lumbar vertebra.

GAARENSTROOM thinks that this anomaly could be operated on. He reminds of the accessory ribs.

X. J. B. POLAK: *Pleuritis Mediastinalis.* (Published in extenso in the Acta radiologica, Vol. 2, Fasc. 6, p. 461.)

Discussion. MARSMAN asks what is the reason why on the radiograph the air lies under the fluid.

POLAK answers that the shadow above the air is not caused by fluid, but by a thickened pleura mediastinalis. Puncture only gave 3 cc. of fluid.

XI. F. G. DE WILDE: *A Case of Spontaneous Healed Echinococcus of the Lung.*

A man of 40 years complained of pain in the right side, cough and fever. Physical examination showed dull percussion behind. Pleuritis exsudativa was supposed. Puncture gave absolutely clear fluid, without cells and without albumen. After half an hour urticaria. Echinococcus was supposed and confirmed radiographically. In the right lung, just above the diaphragma, a round shadow is seen as large as a fist, showing a little air, entered by puncture. WEINBERG's reaction positiv. After three months no physical symptoms are found, but radiographical no changes. Again four months later the patient comes back to tell, that he has given up a glass of stinking fluid with membranes. The echinococcus was perforated in a bronchus, on the new radiograph we only see a light spotty shadow in the right lung.

Discussion. HERTZBERGER has seen many cases of lung-echinococcus in Friesland and often with spontaneous healing.

KEYSER also announces to have seen a case of spontaneous healing.

XII. J. F. L. VAN BREEMEN: *The Theory of Lighttreatment.*

In consequence of a literature study of lighttherapy of the latter 10 years, the reader gives some remarks. In the first place it is very surprising to see how the medical view as to the influence of light, has changed. We also see, that many observations become obsolete in a very short time and cannot serve for a comparison with others, because the nature of the rays were not physically defined. With a scheme of rays, written up till the end of 1922, he shows how the physicists now know the wavelengths of different kinds of radiating energy. With a few words he mentions the important experiments of DORNO in Davos and of NELL in Scheveningen, those of WIDMER on the seacoast of Germany, showing the conformity of the spectrum on the shore and in the high-mountains. This result is very important for our lighttherapy in some forms of tuberculosis. He also draws the attention to the influence, that reactions of one kind of radiating energy may exercise on those of an other kind.

The names: chemical action, heath-action, etc. have a disturbing influence on deeper insight, because they cannot be separated in the different kinds of energy.

After having discussed some physical laws about artificial lightsources, he draws the attention to the total want of a good photometer, whilst theoretically the chance to get one, is very small. It is of great interest in biological and medical examination, to count not only with the rays, present in the spectrum, but also with the quantity, absorbed by different bodies in changing quantity, for also the absorptionlaws of physics hold good in biology. The reader gives some examples of the different action of ultraviolet rays of different wavelengths (400—200 $\mu\,\mu$).

Discussion. TIMMER wants to have understood, that among all artificial lightsources, the Quarzlamp resembles most sunlight. The arclight, according to his opinion, is more like sunlight. Therapeutical results with arclight are better than with quarzlight.

VAN BREEMEN answers, that he agrees with TIMMER, he wanted to say, that the quarzlamp resembles most the action of the rays of the sun in the high-mountains.

WESTERDYK observes, that because the temperature of the artificial light-sources is lower than that of the sun, their action cannot be similar to that of sunrays. They have therefore soaked the coales of an arclamp in solutions of salts in order to give rise to the emissionspectrum of the concerning metal; they so get a larger quantity of ultraviolet light and in this way a compensation against the lower temperatures. He thinks, medical men must work with monochromatical light, obtained by filters, in order to be able to measure the intensity optically.

VAN BREEMEN answers that it is practically impossible to work with monochromatical light, because the quantity of monochromatical light, passing through the filter, is very small. But also from biological point of view, monochromatical light is not good, because we cannot miss the other parts of the spectrum, absorbed by the filters.

XIII. S. KEYSER: *X-Raytreatment of Syringomyelie.* (Will be published in extenso in the Acta radiologica.)

Discussion. DEELEN should like to know something about the followed technic.

KEYSER irradiated areas of 8 × 7 c.m. left and right on the spine, where the medulla is sick. The time between two series was mostly two months.

VOORHOEVE thinks speakers statistical record of great value, because the number of cases of this disease, treated with x-rays is so small and the opinion of the results differ so much. He asks if parts of the medulla not yet affected, have also been treated prophylactically and if yes, with what result. Does it occur that on the one part of the medulla a good success is seen and no influence on another part? Is there any difference in reaction after x-raytreatment of more acute and of more chronical cases?

KEYSER answers the first and the second question with no and as to the last, he did not see any difference.

XIV. L. F. DRIESSEN: *Experimental Researches, Proving the Deleterious Influence of Roentgen-Rays on the Ovules in the Ovary of Rabbits.* (Will be published in extenso in Strahlentherapie.)

Animals, treated with x-rays while young, show disturbances in the development of the embryo and the placenta, when they subsequently become pregnant.

Conclusion: Young women in the period of sexual activity should only exceptionally be treated with Roentgen-rays, considering the danger to their progeny.

Discussion. JANSEN asks if the demonstrated specimen of the rabbit of which the ovary was treated on one side and showing afterwards pregnancy only in the other horn of the uterus, with three fruits, deminishing in size from lateral to medial, does not demonstrate, that the uterus itself has been injured by the treament. We may expect, that the three ovules in the ovary have suffered equally. If really an injury of the uterus occurs, this should be a contra-indication for the intra-uterine radiotreatment of metrorrhagies of

young persons, of which the reader quoted a case and of which favourable statistical records are published by WEIBEL, KRÖNIG, DEGRAIS, Mme FABRE, FAURE and many others.

DRIESSEN answers, that the case showing only unilateral pregnancy, proves, that here an injury of the fruit and not of the ovule has taken place. That this injury does not take place via the ovaries, is shown by the observations, that in the ovary of the treated side, two corpora lutea were developed. He thinks, that we have to do with an injury of the fruit and not of the uterus.

XV. H. A. M. M. LAMMERS: *Radiumtreatment of Cancer of the Lip.* (Published in extenso in Acta radiologica, Vol. 2, Fasc. 6, p. 497.)

Discussion. TIMMER asks if there is any difference microscopically between the successful and the unsuccessful cases.

LAMMERS says that generally it is thought, but that he does not know anything about it, as to his cases.

VAN BREEMEN asks how long the treatment lasts.

LAMMERS answers, that he likes to apply the reckoned out dosis in one session. To that purpose he makes a mould, accurately adjusted to the lip and the tumour. In this mould are laid the radiumsalts with the filters and the protecting leadlayers for upperlip, tongue etc. The mould serves at the same time as a filter for secundary radiation. Altogether this becomes a rather big apparatus, keeping the mouth of the patient wide open. Ordinarily the patient can stand this apparatus a day and a night: against trismus, he gives an injection of morphia. French experimentators want to have observed, that the cancercell is most sensible for radiation during the cellpartition. They think, that all cells undergo partition within about eight days and therefore like to let the treatment last such a long time. This long duration is no obstacle if we apply radiumpuncture and probably in that case the long duration is really most efficient. When we are not able to apply radiopuncture, it is better to apply the wanted quantity of rays in the shortest time possible.

XVI. W. HONDIUS BOLDINGH: *An X-Ray Installation with Continuous Current for Deep Therapy.*

The technical improvements in the latter time of condensors and Kenotrons (high vacuum-hotkathode valvetubes) made it possible, to build a high tension installation of limited dimensions, with which in connection with the main, it is possible to excite a continuous tension of 250,000 volt. Using 10 milliamps, there is only 5 % fluctuation of tension. The maximum-tension, necessary for the hardness of the x-rays to be excited, is about equal to the effective tension and to the average tension, measured easily. A voltmeter can be used, instead of the spargap, most in use to measure the maximum of tension.

Tension being almost continuous, the unfiltered radiation, of course not being homogeneous, is of far more favourable composition, than obtainable with coil or rectifier. With the same maximum of tension the maximum of intensity in the spectrum has a shorter wavelength e. g. 0,08 Ae U. instead of 0,13, compared with coil or rectifier at a tension of 200 KV., minimum wavelength being in that case 0,06 Ae U.

High frequency fibrations in the secundary may be totally avoided. The apparatus acts quite noiseless. Formation of ozon is reduced to a minimum; no separate room is necessary for the hightension apparatus, but it may be erected in the radiation room in an iron railing, connected to earth. The switchboard shows except other apparatus as a voltmeter, also a microampmeter, which in connection with a new intensiometer, allows a continuous inspection of the dosis.

Discussion. VAN EBBENHORST-TENGBERGEN asks if the capacity of the condensors is great enough, not to cause fall of tension by using more milliamperage in the tube.

H. BOLDINGH answers that the capacity of the condensors is 0,02 microfarad and that for instance with a secundary current of 4 milliamps, the fluctuations of tension are 2 %, whilst by changing secundary current, the tension does not change, practically.